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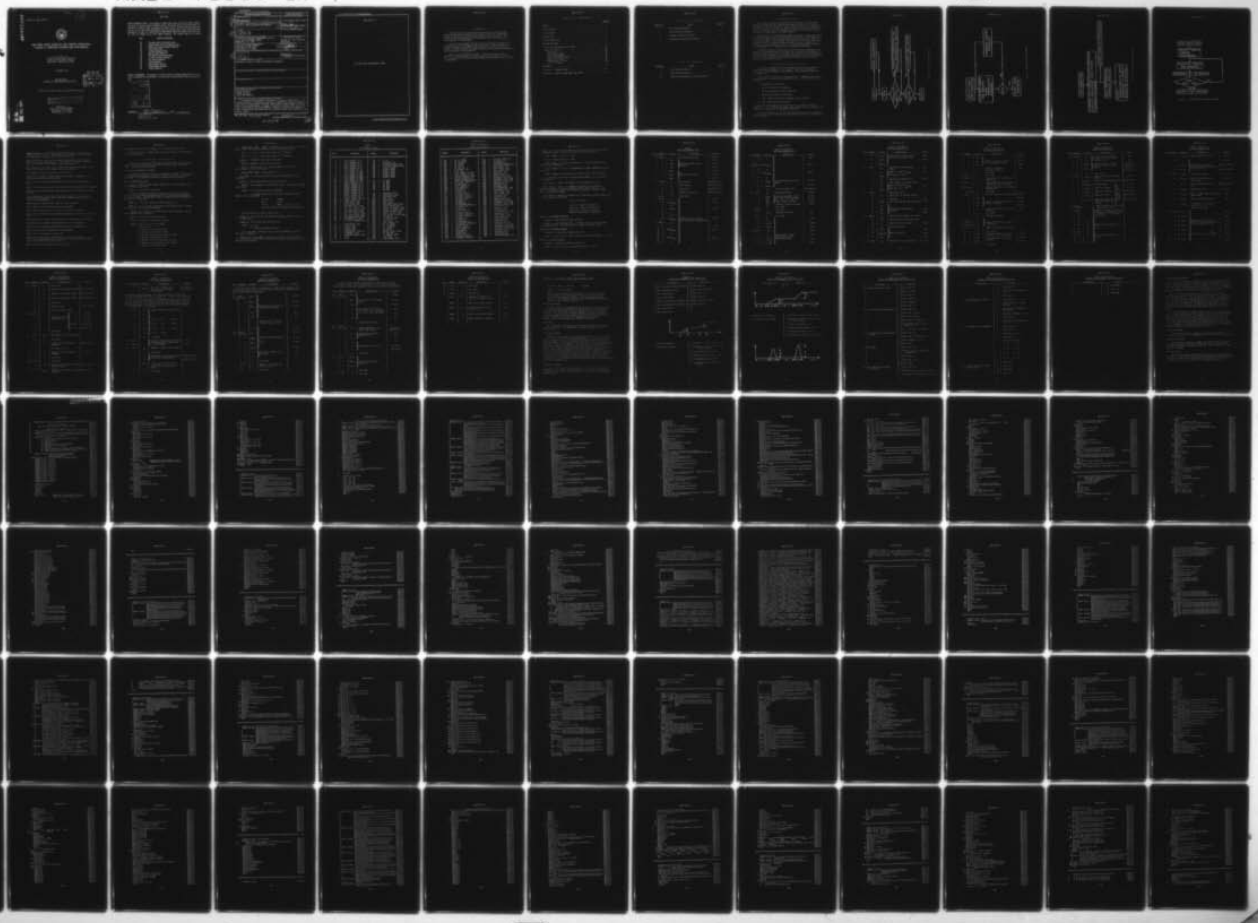

REPORT NO. NADC-76313-30

LOW-SPEED V/STOL STABILITY AND CONTROL PREDICTION - VOLUME II: COMPUTER PROGRAM AND USER MANUAL

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11 JANUARY 1977

INTERIM REPORT
AIRTASK NO. A03V-320D/001B/6F41421201

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Prepared for
NAVAL AIR SYSTEMS COMMAND
Department of the Navy
Washington, D.C. 20361

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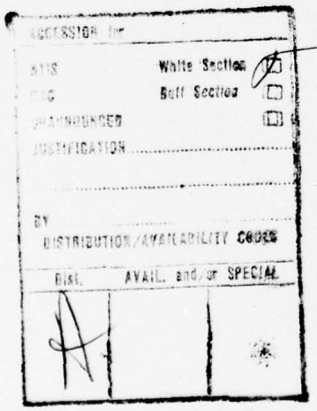

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1. REPORT NUMBER: NADC-76313-30	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): LOW-SPEED V/STOL STABILITY AND CONTROL PREDICTION VOLUME II: COMPUTER PROGRAM USER MANUAL.	5. TYPE OF REPORT & PERIOD COVERED: INTERIM REPORT.
	6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s): J. W. CLARK, JR	8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS: AIR VEHICLE TECHNOLOGY DEPARTMENT (CODE 30) NAVAL AIR DEVELOPMENT CENTER WARMINSTER, PA. 18974	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: AIRTASK NO. A03V-320D/001B/ 6F41421201
11. CONTROLLING OFFICE NAME AND ADDRESS: NAVAL AIR SYSTEMS COMMAND DEPARTMENT OF THE NAVY WASHINGTON, D. C. 20361	12. REPORT DATE: 11 Jan[illegible]977
	13. NUMBER OF PAGES: 149
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office): 143 p.	15. SECURITY CLASS. (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Stability and Control
Flying Qualities
V/STOL Aircraft
V/STOL Aerodynamics

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

A unified prediction method is developed to support V/STOL Stability and Control analyses. The method is geared to a preliminary design environment to facilitate its application using the limited type of data normally available early in the design process. Volume I describes the models which were developed or modified and their validation. Volume II describes the computer program incorporating these models and the associated input data requirements and output format.

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S U M M A R Y

A unified prediction method has been developed to support V/STOL Stability and Control analyses. The method is geared to a preliminary design environment and is documented in Volume I of this report. The method has been programmed for the CDC 6600 and this volume constitutes a User Manual for that program.

Input data requirements are listed and the necessary information for interpretation of the program output is presented. General guidance for using the program is provided in this volume but the user is directed to Volume I of this report for in-depth discussion of the required configuration data and methods of determining it.

Input to the program may be either in English or Metric units. However, all program output is in Metric units as described in reference (a). Listings of the Fortran code and sample input and output are presented in Appendices.

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INTRODUCTION

This report provides the necessary user information for applying the NADC VSAC (V/STOL Stability and Control) computer program. The program computes the stability and control characteristics (both static and dynamic) of a V/STOL aircraft configuration based on geometric and basic aerodynamic inputs. The program flow and computational options are described herein as our input data requirements and output formats.

The majority of the program development was based on calculations using the standard English system of units (slug-foot-second). Recent emphasis on conversion to Metric units (kilogram-metre-second) necessitated conversion of input and output to this system. The capability of accepting input data in English units (in addition to Metric units) has been retained but all output is presented in Metric units. All calculations performed internal to the program were left in English units as originally developed.

A complete listing of the Fortran code is contained in Appendix A and sample input and output lists for a test case are presented in Appendix B. The basic program structure is patterned after that of a similar program for helicopters and stoppable rotor aircraft developed by Bell Helicopter Company (reference (b)) and some of the subroutines are taken directly from that source or modified for use here.

PROGRAM DESCRIPTION

The total configuration forces and moments are calculated using the models described in Volume I of this report. This force and moment formulation is used throughout the remainder of the program calculations described below.

The user has the option of selecting from 1 to 6 different analyses to be performed for a given set of configuration data. The six options are as follows:

1. Nonlinear trim iteration;
2. Stability derivative estimation;
3. Small perturbation stability analysis;
4. Maneuver time history calculation;
5. Least squares time history parameter vector analysis;
6. Time history parameter plotting.

The program flow through each of these options is presented in Figure 1. Figures 2, 3, and 4 present the program flow through the trim, stability, and time history portions of the program, respectively.

The total program consists of a main driving routine and 55 subroutines. A brief description of the main and each subroutine (listed in alphabetical order) follows.

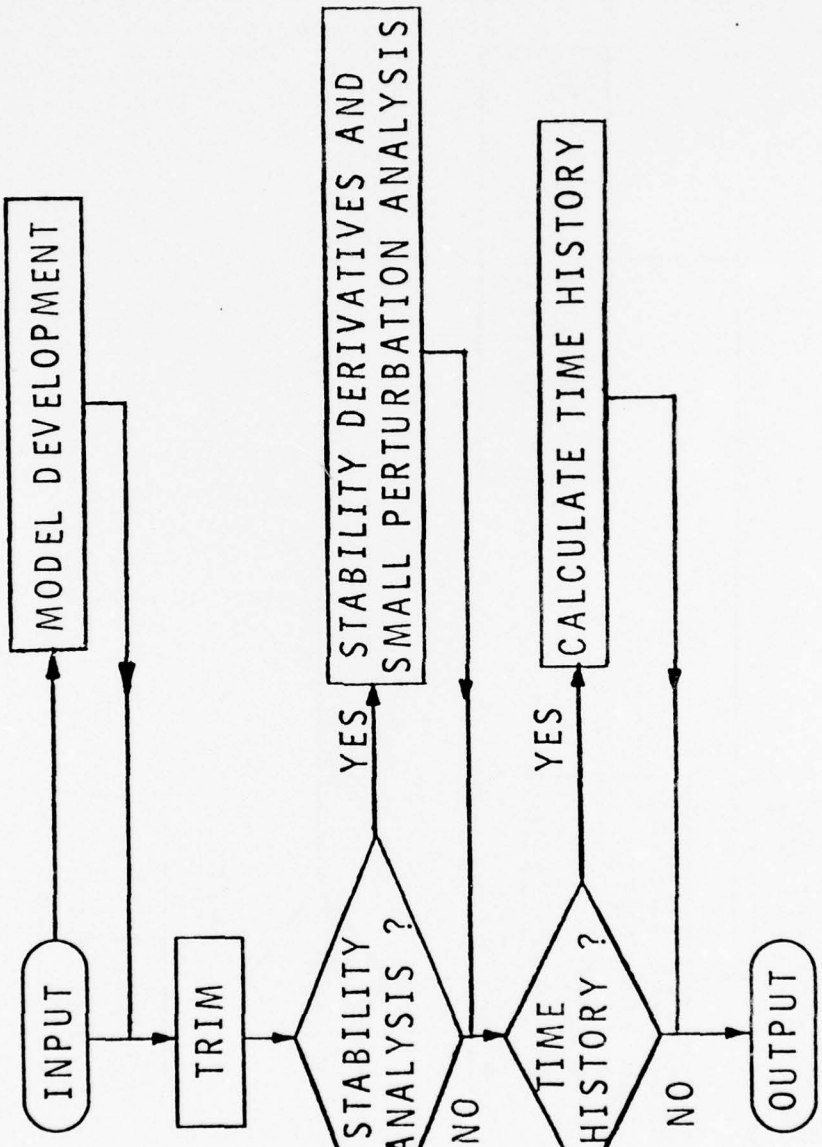


FIGURE 1: TOTAL PROGRAM FLOWCHART

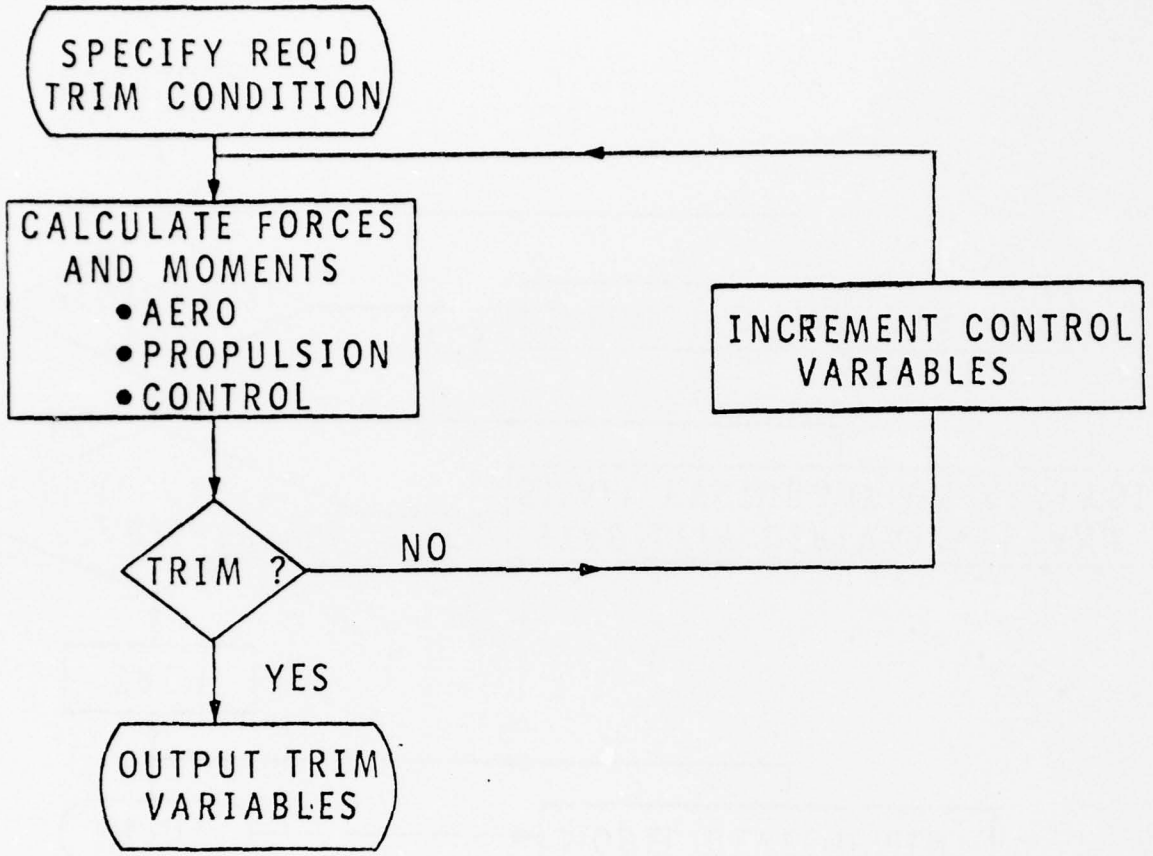


FIGURE 2: TRIM CALCULATION FLOWCHART

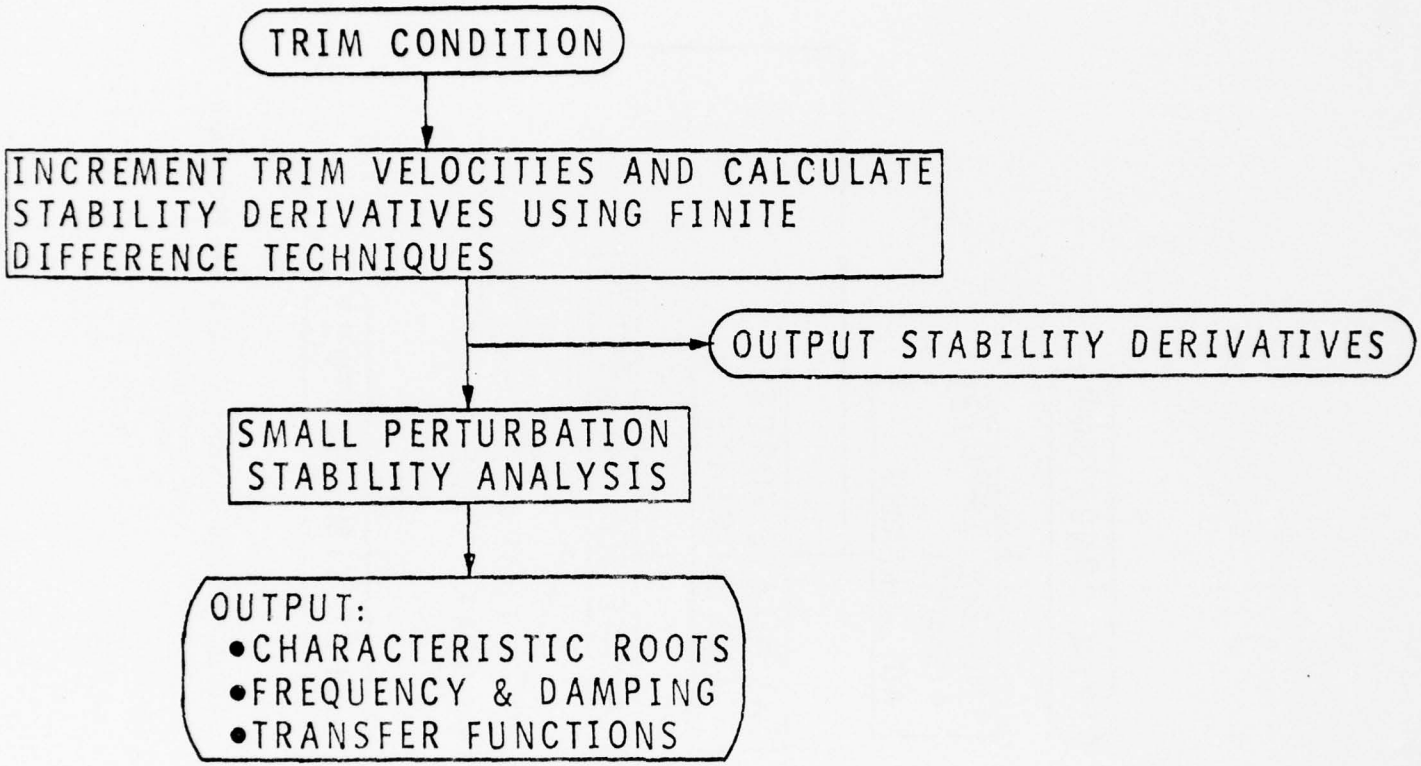


FIGURE 3: STABILITY ANALYSIS FLOWCHART

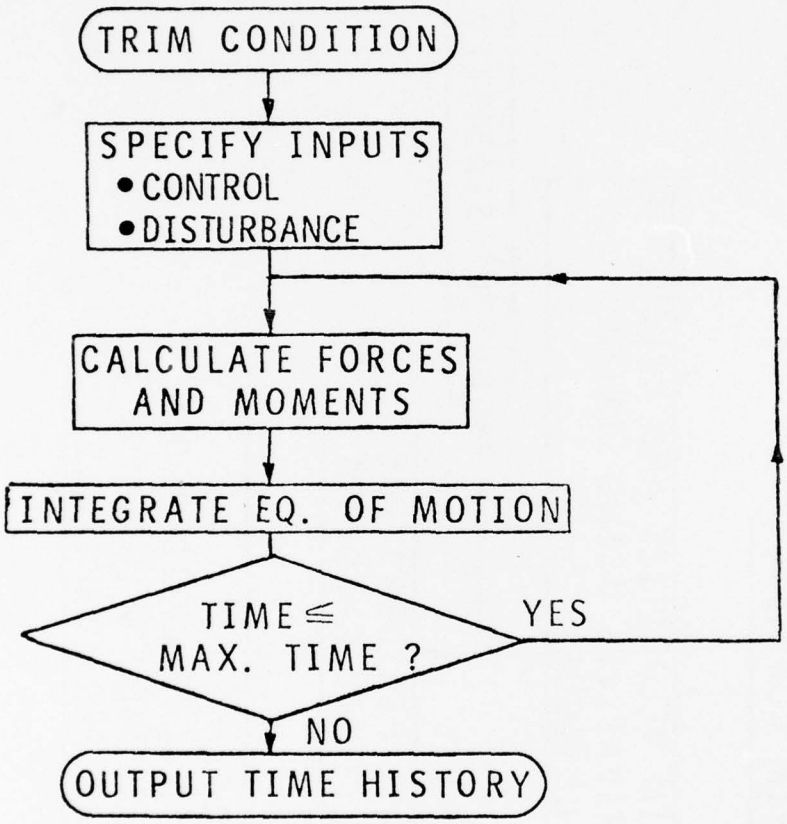


FIGURE 4: TIME HISTORY CALCULATION FLOWCHART

VSTOL is the main driving routine. It reads the first data card and determines the program path to be taken depending on the value of the variable NPART.

AJACOB controls the finite difference calculations of partial derivatives for both the trim Jacobian and the final control derivatives.

ANAL is the main model formulation subroutine. It is here that all model component forces and moments are calculated and summed. The output of this subroutine consists of the vehicle total forces and moments.

CLCD calculates the lift and drag of each of the aerodynamic lifting surfaces based on geometry and inputs from ANAL and YFIX.

COMSOL calculates the solution of a set of simultaneous equations with complex coefficients. It is required by the small perturbation stability analysis portion of the program.

CONTRL represents the formulation of the vehicle control system. The current code is applicable to conventional mechanical control systems. More complex control laws may be programmed as needed. Comment cards are provided within CONTRL to assist the user in such an effort and the XS input array is available for additional input requirements.

CONV converts input data from Metric units to English equivalents for use within the program.

CONVI converts time history input data from Metric units to English equivalents.

CON1 calculates the gearing relationships for the primary controllers.

CPLOT controls CALCOMP plotting of the time history variables. This routine uses in-house NADC plotting routines and would require reprogramming for use on other computing facilities.

CURVET performs a least squares curve fit analysis on selected time history variables. Both amplitude and phase are computed and may be normalized by the corresponding parameters for a reference variable.

DAMPER reduces control variable increments as a trim solution is approached to improve the convergence of the trim iteration. Both the increment used to compute the Jacobian and the maximum trim variable increments are reduced as the trim errors are reduced.

DATA is a Block Data Subroutine which contains required literal data for output formats.

DET computes the value of an n^{th} order determinant.

ELEC calculates time constants, damping ratios and gains in support of the stability analysis portion of the program.

GUST determines the gust velocity at the center of pressure of each component of the aircraft. This routine is called only when a gust format is specified as a time history input.

INIT controls printing of the time history outputs.

ITRIM performs the trim iteration calculations and determines when the trim requirements are satisfied.

IVAR initializes required parameters for any time history input functions.

JACOBI calculates the Jacobian for use in the trim iteration. An additional entry point, BJACOB, is used to calculate the final control derivative matrix.

JETINT calculates the inlet momentum and propulsion-induced aero forces and moments acting on the vehicle.

LAMODE calculates the lateral/directional characteristic roots and transfer functions.

LIFJET calculates the forces and moments produced by the vectorable nozzle engines. Included in this subroutine is the calculation of gyroscopic moments due to engine angular momentum.

LMODE calculates the longitudinal characteristic roots and transfer functions.

MANU is the main routine of the time history calculation. It controls the calculation of forces and moments due to control and disturbance inputs and integrates the equations of motion.

MATRIX calculates the elements of the Euler angle transformation matrix.

MNEM performs required initialization prior to problem solution.

MODE controls calculation of transfer function numerator roots and gains.

OFFTRM computes the required trim forces and moments for a specified trim condition.

PARA prints output message indicating whether or not the aircraft has been trimmed at the specified condition.

PPLOT controls on-line printer plotting of time history variables.

RANG computes the Euler angles between two sets of axes whose orientations are specified.

RATI limits trim control variable increments to preselected maxima during the trim iteration.

REACT computes the forces and moments produced by the RCS nozzles.

READIN, as the name implies, reads the input data in both standard and namelist format.

RIEMAN integrates a second order differential equation. It is used to calculate RCS thrust when a second order lag is present and may be used in the programming of higher order control system models.

ROOA calculates the roots of the characteristic matrix in the stability analysis portion of the program. A call to ROOA sets initial conditions and a call to ROOB (an entry point) calculates the roots.

SLTE substitutes the proper control vector into the proper location in the characteristic matrix for transfer function calculation.

SLTT performs the inverse operation to that of SLTE.

SOLVE solves a system of linear equations by Gaussian elimination. It is used during the trim iteration process.

SRT is the main routine controlling the solution for the characteristic roots.

STAB is the driving routine for the stability analysis section of the program.

START performs initializations, transformations, etc. to begin each problem solution.

STLJES integrates a first order differential equation. It is used to calculate RCS thrust when a first order lag is present and may be used in control system programming.

TIMEX determines computer usage times for output purposes.

TINIT augments the initialization performed in MNEM.

TRIM is the driving routine for the trim section of the program.

TURN calculates vehicle forces and moments required for trim in a coordinated turn.

VARI implements the input forcing functions for time history calculations.

VR2D performs the standard two-dimensional vector transformation.

VR3D performs the standard three-dimensional vector transformation.

WRFM prints the vehicle component forces and moments.

WROT1 prints the heading for output pages.

WRVP prints the partial derivative matrix for each trim iteration. A call to the entry point, WRVP1, prints the complete control derivative matrix after a trim solution has been obtained.

XPRO calculates the standard vector cross product.

YFIX augments CLCD in the calculation of lift and drag coefficients.

Program operation, including input and output formats, are described in the following section.

PROGRAM OPERATION

Guidance in program operation may be logically divided into two major topics; input data requirements and format and output data content and format. Each will now be described.

INPUT DATA REQUIREMENTS AND FORMAT

The input data deck for one run of the program consists of from 1 to 104 cards depending on the mode of analysis selected. Each card, its content and format, is described with additional information where required.

Card 1: Mode Control Card

Variables: NPART, NPRINT, NSCALE, NVARA, AL(1), AH(1), NVARB, AL(2), AH(2), NVARC, AL(3), AH(3).

Format: I2, 2I4, 3(I5, 5X, 2F5.0).

The value of NPART determines the mode of analysis to be performed. Some or all of the remaining variables on Card 1 are required depending on the value of NPART. The allowable values for NPART and required additional variables are listed below.

NPART = 1: Trim only (card 83 is the last data card).

NPART = 2: Trim, stability analysis and time history (cards 1 through 84 and at least one card 85 is required).

NPRINT: Print frequency for time history output (output at t=0 and every NPRINTth point thereafter).

NPART = 3: Print-plot time history data.

NPRINT: Frequency of points to be plotted.

NSCALE: Control of plot scale factors.

= 0, no effect

= 1, multiply first scale by 1000

= 2, multiply second scale by 1000

= 3, multiply first and second scale by 1000

= 4, multiply third scale by 1000

= 5, multiply first and third scale by 1000

= 6, multiply second and third scale by 1000

= 7, multiply all scales by 1000

NVARA, NVARB, NVARC: Indices of variables to be plotted (= 0: no plot). Table I lists the available variables and their associated indices.

AL(I), I = 1, 2, 3: Lower scale limit for I^{th} variable.

AH(I), I = 1, 2, 3: Upper scale limit for I^{th} variable.

NPART = 4: CALCOMP plots of time history data.

NPRINT: Frequency of points to be plotted.

NSCALE: Controls plot size - 100(%) produces 8 1/2" x 11", 50(%) produces 4 1/4" x 5 1/2", etc.

NVARA, NVARB, NVARC: (same as NPART = 3).

When NPART = 4, the next two cards contain the desired plot title (8A10/6A10).

NPART = 6: Revise input data and rerun time history.

NPRINT: Print frequency of time history output. Print every $NPRINT^{th}$ output point.

NSCALE: = 0, no change in cards 5 through 83.

= 1, change selected data from cards 5 through 83 using NAMELIST format as follows:

Col 2-8	$CHANGE
Col 9	blank
Col 10 . . .	XW(5) = 1., XT(1) = 50., . . .
The last variable is followed by a blank and $.	

Cards 84 and 85 are input in either case.

NPART = 7: Trim plus small perturbation stability analysis (card 83 is last data card).

NPART = 9: Revise input data and rerun trim.

NVARA: = 0, trim.

= 1, trim plus stability analysis.

Data from cards 5 through 83 are revised using NAMELIST format as described for NPART = 6.

NPART = 10: Same as NPART = 9 with the exception that XT(5) through XT(11) and XT(15) through XT(18) assume initial values corresponding to the previous trim condition.

TABLE I

PLOT VARIABLE INDICES

INDEX	VARIABLE	INDEX	VARIABLE
1	LIFT THRUST 1, N	79	Z, M
2	LIFT THRUST 2, N	80	ALTITUDE, M
3	LIFT THRUST 3, N	81	GROUND SPEED, KTS
4	LIFT THRUST 4, N	82	FLT PATH ANGLE, DEG
5	LIFT THRUST 5, N	83	U-DOT, MPSS
6	LIFT THRUST 6, N	84	V-DOT, MPSS
7	LIFT ANGLE 1, DEG	85	W-DOT, MPSS
8	LIFT ANGLE 2, DEG	86	P-DOT, DPSS
9	LIFT ANGLE 3, DEG	87	Q-DOT, DPSS
10	LIFT ANGLE 4, DEG	88	R-DOT, DPSS
11	LIFT ANGLE 5, DEG		
12	LIFT ANGLE 6, DEG	90	U, MPS
13	REACT THRUST 1, N	91	V, MPS
14	REACT THRUST 2, N	92	W, MPS
15	REACT THRUST 3, N	93	P, DPS
16	REACT THRUST 4, N	94	Q, DPS
17	REACT THRUST 5, N	95	R, DPS
18	REACT THRUST 6, N		
19	REACT THRUST 7, N	97	PSI-DOT, DPS
20	REACT THRUST 8, N	98	THETA-DOT, DPS
21	REACT THRUST 9, N	99	PHI-DOT, DPS
22	REACT THRUST 10, N	100	PSI, DEG
23	LONG STICK, CM	101	THETA, DEG
24	STAB DEFL, DEG	102	PHI, DEG
25	LAT STICK, CM	103	FIX ENG THROT, PCT
26	AILERON DEFL, DEG	104	LONG STICK, PCT
27	FWD RCS THRUST, PCT	105	ALPHA (L WING), DEG
28	FWD RCS ANGLE, DEG	106	ALPHA (R WING), DEG
29	SPOILER DEFL, DEG	107	ALPHA (STAB), DEG
30	AFT RCS THRUST, PCT	108	ALPHA (FIN), DEG
31	AFT RCS ANGLE, DEG	109	YAW ALPHA (FUS), DEG
32	RUD PEDAL DEFL, CM	110	FS CG, CM
33	RUDDER DEFL, DEG	111	U (GUST), MPS
34	LAT RCS THRUST, PCT	112	N-X, G'S
		113	LAT STICK, PCT
70	FLAP DEFL, DEG	114	CL (L WING)
71	X-DOT, MPS	115	CL (R WING)
72	Y-DOT, MPS	116	CL (STAB)
73	Z-DOT, MPS	117	CL (FIN)
74	HORIZONTAL DIST, M	118	ALPHA (FUS), DEG
75	AIRSPEED, KTS	119	BL CG, CM
76	HEADING ANGLE, DEG	120	V (GUST), MPS
77	X, M	121	N-Y, G'S
78	Y, M	122	RUD PEDAL, PCT

TABLE I (Continued)

PLOT VARIABLE INDICES

INDEX	VARIABLE	INDEX	VARIABLE
123	CD (L WING)	167	FZ-LIFT JETS, N
124	CD (R WING)	168	FZ-INLET, N
125	CD (STAB)	169	FZ-WEIGHT, N
126	CD (FIN)	170	FZ-INTERFERENCE, N
127	WL CG, CM	171	RM-TOTAL, N.M
128	W (GUST), MPS	172	RM-R WING, N.M
129	N-Z, G'S	173	RM-L WING, N.M
130	LIFT THROT 1, PCT	174	RM-STAB, N.M
131	LIFT THROT 2, PCT	175	RM-FUS, N.M
132	ANGLE LEVER 1, PCT	176	RM-RT JET, N.M
133	RT JET THRUST, N	177	RM-LEFT JET, N.M
134	ANGLE LEVER 2, PCT	178	RM-REACT JTS, N.M
135	LEFT JET THRUST, N	179	RM-LIFT JETS, N.M
136	FX-TOTAL, N	180	RM-INLET, N.M
137	FX-RT WING, N	181	RM-FIN, N.M
138	FX-L WING, N	182	RM-GYRO, N.M
139	FX-STAB, N	183	RM-INTERFERE, N.M
140	FX-FUS, N	184	PM-TOTAL, N.M
141	FX-RT JET, N	185	PM-R WING, N.M
142	FX-LEFT JET, N	186	PM-L WING, N.M
143	FX-REACT JETS, N	187	PM-STAB, N.M
144	FX-LIFT JETS, N	188	PM-FUS, N.M
145	FX-INLET, N	189	PM-RT JET, N.M
146	FX-FIN, N	190	PM-LEFT JET, N.M
147	FX-WEIGHT, N	191	PM-REACT JTS, N.M
148	FX-INTERFERENCE, N	192	PM-LIFT JETS, N.M
149	FY-TOTAL, N	193	PM-INLET, N.M
150	FY-FUS, N	194	PM-FIN, N.M
151	FY-RT JET, N	195	PM-GYRO, N.M
152	FY-LEFT JET, N	196	PM-INTERFERE, N.M
153	FY-REACT JETS, N	197	YM-TOTAL, N.M
154	FY-LIFT JETS, N	198	YM-R WING, N.M
155	FY-INLET, N	199	YM-L WING, N.M
156	FY-FIN, N	200	YM-STAB, N.M
157	FY-WEIGHT, N	201	YM-FUS, N.M
158	FY-INTERFERENCE, N	202	YM-RT JET, N.M
159	FZ-TOTAL, N	203	YM-LEFT JET, N.M
160	FZ-RT WING, N	204	YM-REACT JTS, N.M
161	FZ-L WING, N	205	YM-LIFT JETS, N.M
162	FZ-STAB, N	206	YM-INLET, N.M
163	FZ-FUS, N	207	YM-FIN, N.M
164	FZ-RT JET, N	208	YM-GYRO, N.M
165	FZ-LEFT JET, N	209	YM-INTERFERE, N.M
166	FZ-REACT JETS, N		

NPART = 11: Least squares curve fit of time history data (used primarily for sinusoidal input). Available variables are listed in Table I.

NVARA: Number of curves to be fit.

AL(1): Assumed frequency, ω (Hz).

NVARB: Number of reference variables to be used for amplitude ratio and phase angle differences.

AL(2): Number of curves to be expressed as linear combinations of two other curves.

NVARC: Number of data points to be skipped before curve fit begins.

The following cards, which are necessary when NPART = 11, are coded in a 1415 format.

Next card(s): Indices (from Table I) of variables to be fit.

Next card (s): Cols 1 - 5: Number of variables to be compared to reference variable; cols 6-10: Reference variable index; cols 11 . . .: Indices of variables to compared to reference variables. There are NVARB sets of cards of this format.

Next card(s): Indices of variables to be expressed as linear combinations of other variables in the form:

$$A = k_1 B + k_2 C + k_3$$

Cols 1-5: Index for variable A;

Cols 6-10: Index for variable B;

Cols 11-15: Index for variable C.
There are AL(2) cards of this type.

Cards 2-4: Run Number and Title

Variables: IPSN, ICOM (200 characters max)

Format: 2X, I8, 6A10/7A10/7A10. If IPSN is negative, all input data are in English units. If IPSN is positive, input is in Metric units.

Cards 5-83: Main Data Package

Variables: (Listed and defined in Table II).

Format: 7F10.0 per card. These cards are required for NPART = 1, 2, and 7.

Card 84: Time History Data

Variables: (Listed and defined in Table II).

Format: 6F10.0 This card is required for NPART = 2 and 6.

TABLE II
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
5	XB(1)	W	Aircraft gross weight	N (lbs)
	2	FS_F	Fuselage reference point location	cm (in)
	3	BL_F		cm (in)
	4	WL_F		cm (in)
	5	FS_{CG}	Aircraft CG location	cm (in)
	6	BL_{CG}		cm (in)
	7	WL_{CG}		cm (in)
6	XB(8)	I_x	Roll inertia	$kg \cdot m^2 (slug \cdot ft^2)$
	9	I_y	Pitch inertia	$kg \cdot m^2 (slug \cdot ft^2)$
	10	I_z	Yaw inertia	$kg \cdot m^2 (slug \cdot ft^2)$
	11	I_{xz}	Product of inertia	$kg \cdot m^2 (slug \cdot ft^2)$
	12-14	---	(not used)	
7	XB(15)	α_o	Coefficients in fuselage force and moment approximations	deg
	16	$(N/q_o)_{max}$		$m^2 (ft^2)$
	17	n_3		
	18	$(A/q_o)_o$		$m^2 (ft^2)$
	19	---		
	20	n_1		
	21	$(S/q_o)_{max}$		$m^2 (ft^2)$
8	XB(22)	n_2		
	23	α_1		deg
	24	$(M/q_o)_{max_1}$		$m^3 (ft^3)$
	25	n_4		
	26	$(M/q_o)_{max_2}$		$m^3 (ft^3)$
	27	n_5		

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	28	α_2		deg
9	XB(29)	$(N/q_o)_{max_1}$		$m^3(ft^3)$
	30	n_6		
	31	$(N/q_o)_{max_2}$		$m^3(ft^3)$
	32	n_7		
	33	FS_{RAM}	Inlet momentum application point	cm (in)
	34	WL_{RAM}		cm (in)
	35	w_a	Inlet air weight flow	N/sec(lbs/sec)
10	XW(1)	S_W	Wing planform area	$m^2(ft^2)$
	2	FS_{RW}	Center of pressure location for right wing ($FS_{LW}=FS_{RW}$,	cm (in)
	3	BL_{RW}	$BL_{LW}= -BL_{RW}$, $WL_{LW}=WL_{RW}$)	cm (in)
	4	WL_{RW}		cm (in)
	5	i_W	Geometric incidence of wing	deg
	6-7	---	(not used)	
11	XW(8)	---	(not used)	
	9	ε/C_{L_W}	Downwash coefficient	deg
	10-11	---	(not used)	
	12	Cl_{β_o}		1/rad
	13	$\Delta Cl_\beta/C_L$		1/rad
	14	$\Delta Cl_r/C_L$		1/rad
12	XW(15)	Cl_p		1/rad
	16	Cn_{β_o}	Coefficients in wing lateral/directional aerodynamic model	1/rad
	17	$\Delta Cn_\beta/C_L^2$		1/rad
	18	$\Delta Cn_r/C_L^2$		1/rad

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	19	$\Delta C_{n_r}/C_D$	Coefficients in wing lateral/ direction aerodynamic model	1/rad
	20	$\Delta C_{n_p}/C_L$		1/rad
	21	$\Delta C_{n_p}/C_{D_\alpha}$		
13	YW(1)	$\Lambda_{1/4}$	Sweep angle of wing quarter-chord	deg
	2	α_b	Angle of attack at $C_{L_{max}}$ and $C_{L_{max}}$ for $\alpha<90°$	deg
	3	$C_{L_{max}}$		
	4	S_e	Exposed wing planform area	$m^2(ft^2)$
	5	d/b	Body diameter to wing span ratio	
	6	α_b	Angle of attack at $C_{L_{max}}$ and $C_{L_{max}}$ for $\alpha < 90°$	deg
	7	$C_{L_{max}}$		
14	YW(8)	λ	Wing taper ratio	
	9	λ_e	Taper ratio of exposed planform	
	10	$\bar{c}$	Wing MAC	m(ft)
	11	$\Delta C_{D_o}/\delta_f$	Zero-lift drag per flap deflection	1/deg
	12	C_{D_o}	Coefficients in wing drag equation	
	13	C_{D_α}		1/deg
	14	$C_{D_\alpha 2}$		$1/deg^2$
15	YW(15)	C_{m_o}	Wing zero-lift moment coefficient	
	16	AR_e	Aspect ratio of exposed planform	
	17	a_o	Wing 2-D lift curve slope	1/deg
	18	AR	Wing aspect ratio	
	19	C_{L_o}/δ_f	Wing flap effects	1/deg
	20	$\Delta C_{L_{max}}/\delta_f$		1/deg
	21	$C_{m_{\delta_f}}$		1/deg
16	XE(1)	S_H	Horizontal stab. planform area	m^2 (ft^2)

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	2	FS_H	Center of pressure location for horizontal stabilizer	cm (in)
	3	BL_H		cm (in)
	4	WL_H		cm (in)
	5	i_H	Geometric incidence of horizontal stabilizer	deg
	6-7	---	(not used)	
17	XE(8-14)	---	(not used)	
18	YE(1-7)	---	(same as YW(1-7) for horizontal stabilizer)	
19	YE(8-14)	---	(same as YW(8-14) for horizontal stabilizer; YE(11) not used)	
20	YE(15-18)	---	(same as YW(15-18) for horizontal stabilizer)	
	(19-21)	---	(not used)	
21	XF(1)	S_V	Vertical stabilizer planform area	m^2 (ft^2)
	2	FS_V	Center of pressure location for vertical stabilizer	cm (in)
	3	BL_V		cm (in)
	4	WL_V		cm (in)
	5	i_V	Geometric incidence of vertical stabilizer	deg
	6	---	(not used)	
	7	K_V	Sidewash coefficient	
22	YF(1-7)	---	(same as YE(1-21) for vertical stabilizer)	
23	YF(8-14)	---		
24	YF(15-21)	---		
25	XJ(1)	n_{FJ}	Number of fixed nozzles (2 max)	
	2-3	---	(not used)	
	4	FS_{FJ}	Location of right (or center) nozzle (if n_{FJ} = 2, left jet is assumed to be symetrically located)	cm (in)
	5	BL_{FJ}		cm (in)
	6	WL_{FJ}		cm (in)
	7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
26	XJ(8)	ψ_{FJ}	Thrust vector orientation relative to x-axis (right or center jet)	deg
	9	θ_{FJ}		deg
	10	$(H_{FJ})_R$	Angular momentum of right and left engines at max thrust	$kg \cdot m^2/sec$ ($slug \cdot ft^2/sec$)
	11	$(H_{FJ})_L$		$kg \cdot m^2/sec$ ($slug \cdot ft^2/sec$)
	12-14	---	(not used)	
27	XC(1)	$(\delta_T)_{TOT}$	Range of fixed nozzle engine throttle	cm (in)
	2	T_{FJ}/δ_T	Thrust per throttle deflection	N/cm (lbs/in)
	3	$(\delta_{T_1})_{TOT}$	Throttle range (Vectorable nozzle control set 1)	cm (in)
	4	$(\delta_{\theta_1})_{TOT}$	Angle lever range (Vectorable nozzle control set 1)	cm (in)
	5	T_J/δ_{T_1}	Thrust per throttle (Vectorable nozzle control set 1)	N/cm (lbs/in)
	6	$\Delta\theta_J/\delta_{T_1}$	Angle per throttle (Vectorable nozzle control set 1)	deg/cm (deg/in)
	7	$\Delta\theta_J/\delta_{\theta_1}$	Angle per angle lever (=0 if XC (36-47) are used) (Vectorable nozzle control set 1)	deg/cm (deg/in)
28	XC(8-12) (13-14)	---	(same as XC(3-7) for vectorable nozzle control set 2)	
29	XC(15)		Number of control set used for control of vectorable nozzles 1 through 6. If no control, set to zero.	
	16			
	17			
	18			
	19	A_T	Coefficients linking δ_{T_1} to δ_{T_2}	%
	20	B_T		
	21	C_T		1/%
30	XC(22)	A_θ	Coefficients linking δ_{θ_1} to δ_{θ_2}	%
	23	B_θ		
	24	C_θ		1/%

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	25	$(\delta_S)_{TOT}$	Longitudinal stick range	cm (in)
	26	Δ_S		cm (in)
	27	$(i_S/\delta_S)_1$	Coefficients describing horizontal stabilizer gearing ($+\delta_S$ yields $+i_S$)	deg/cm (deg/in)
	28	$(i_S/\delta_S)_2$		deg/cm (deg/in)
31	XC(29)	$(\delta_Y)_{TOT}$	Lateral stick range	cm (in)
	30	$(\delta_Y)_{LEFT}$	Max left stick deflection (neg. value)	cm (in)
	31	δ_a/δ_Y	Aileron gearing ($+\delta Y$ yields $+\delta_a$)	deg/cm (deg/in)
	32	$(\delta_R)_{TOT}$	Rudder pedal range	cm (in)
	33	$(\delta_r)_{max}$	Max t.e. right rudder deflection (neg. value)	deg
	34	$(\delta_r)_{TOT}$	Range of rudder deflection	deg
	35	η_{link}	= 0 if XC(6, 7, 11, 12) are used for θ_J vs δ_θ; ≠ 0 if XC(36-47) are used	
32	XC(36)	$(\delta_{\theta_1})_1$		cm (in)
	37	$(\Delta\theta_J)_1$		deg
	38	$(\delta_{\theta_1})_2$	Coordinates which define piecewise linear functions for $\Delta\theta_J$ vs δ_{θ_1} and $\Delta\theta_J$ vs δ_{θ_2}	cm (in)
	39	$(\Delta\theta_J)_2$		deg
	40	$(\delta_{\theta_1})_3$		cm (in)
	41	$(\Delta\theta_J)_3$	If $\delta_\theta \leq (\delta_\theta)_1$, $\Delta\theta_J = \frac{(\Delta\theta_J)_1}{(\delta_\theta)_1}\delta_\theta$	deg
	42	$(\delta_{\theta_2})_1$		cm (in)

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
33	XC(43)	$(\Delta\theta_J)_1$	If $\delta_\theta \geq (\delta_\theta)_3$, $\Delta\theta_J = (\Delta\theta_J)_3$	deg
	44	$(\delta_{\theta_2})_2$		cm (in)
	45	$(\Delta\theta_J)_2$		deg
	46	$(\delta_{\theta_2})_3$		cm (in)
	47	$(\Delta\theta_J)_3$		deg
	48-49	---	(not used)	
34	XC(50)	A_1		
	51	B_1		1/kt
	52	C_1		$1/kt^2$
	53	D_1		$1/kt^3$
	54	A_2		1/kt
	55	B_2		$1/kt^2$
	56	A_4	Propulsion induced aerodynamic interference coefficients.	m (ft)
35	XC(57)	B_4		m/kt (ft/kt)
	58	C_4		m/kt^2 (ft/kt^2)
	59	D_4		m/kt^3 (ft/kt^3)
	60	A_3		m/kt (ft/kt)
	61	B_3		m/kt^2 (ft/kt^2)
	62-63	---	(not used)	
36	XT(1)	$\dot{x}_T$	Inertial trim velocity (+North)	kts
	2	$\dot{y}_T$	Inertial trim velocity (+East)	kts

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	3	$\dot{h}_T$	Trim rate of climb (+up)	m/sec (ft/sec)
	4	h_T	Trim altitude	m (ft)
	5	ψ_T	Trim yaw angle (ψ = 0° is North)	deg
	6	θ_T	Trim pitch angle (+nose up)	deg
	7	ϕ_T	Trim roll angle (+rt. wing down)	deg
37	XT(8)	δ_T	Initial trim control guess	%
	9	δ_S		%
	10	δ_Y		%
	11	δ_R		%
	12	n_z	Load factor — For turning trim; First non-zero value defines turn	g's
	13	Φ_{TURN}	Bank angle	deg
	14	R	Turn radius	m (ft)
38	XT(15)	δ_{T_1}	Initial trim control guess	%
	16	δ_{T_2}		%
	17	δ_{θ_1}		%
	18	δ_{θ_2}		%
	19	δ_f	Wing flap deflection	deg
	20	---	(not used)	
	21	η_{TRIM}	Trim indicator if $n_z \neq 1$; = 0 for coordinated turn, = 1 for pull up or push over	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
39	XT(22)	---	(not used)	
	23	$\ddot{x}_T$	Inertial accerleration (+North)	m/sec^2 (ft/sec^2)
	24	$\ddot{y}_T$	Inertial acceleration (+East)	m/sec^2 (ft/sec^2)
	25	$\ddot{z}_T$	Inertial acceleration (+down)	m/sec^2 (ft/sec^2)
	26	---	(not used)	
	27	c	Speed of sound	m/sec (ft/sec)
	28	σ	Local atm. density ratio	
40	XD(1)		Allowable errors in trim values of: X	N (lbs)
	2		Y	N (lbs)
	3		Z	N (lbs)
	4		M and N	N·m (ft.lbs)
	5		L	N·m (ft.lbs)
	6-7	---	(not used)	
41	XI(1)	n_{max}	Max number of trim iterations	
	2-3	---	(not used)	
	4	Δ_1	Linear velocity derivative increment	m/sec (ft/sec)
	5		(set equal to 1.0)	
	6	Δ_2	Angular velocity derivative increment	rad/sec
	7	---	(not used)	
42	XI(8-11)	---	(not used)	
	12	Δx_i	Initial trim variable correction increment limit	deg or cm (in)
	13	$\Delta x_{i_{min}}$	Minimum trim variable correction increment	deg or cm (in)

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
	14	Δ_{max}	Max force or moment error for correction increment limit halving	N (lbs) or N·m (ft.lbs)

Trim Correction Limit Halving: At each trim iteration, corrections, Δx_i, are calculated for each control variable. If any of the corrections is greater than the limit, all are ratioed down such that the largest is equal to the limit. Additionally, if after any iteration the force and moment errors are all less than XI (14), the correction limit is halved but never decreased to a value less than XI (13). This process enhances the convergence to a trim solution.

43	XI(15)	x_1	Control variables used for trim	
	16	x_2		
	17	x_3	= 1:δ_T = 5:ψ = 9:δ_{T_2}	
	18	x_4	= 2:δ_S = 6:θ = 10:δ_{θ_1}	
	19	x_5	= 3:δ_Y = 7:ϕ = 11:δ_{θ_2}	
	20	x_6	= 4:δ_R = 8:δ_{T_1}	
	21	---	(not used)	
44	TS(1-7)		Specified times during a maneuver at which stability analyses are to be performed	sec
45	TS(8-14)			sec
46	YR(1)	η_{RJ}	Number of reaction jets (10 max)	
	2	---	(not used)	
	3	A	Coefficients relating RCS thrust available vs engine thrust	%/10^3 N (lbs)
	4	B		%/10^6 N^2 (lbs^2)
	5	η_{RCS}	First η_{RCS} vectorable nozzle thrusts effect available RCS thrust	
	6-7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
The next 20 cards consist of 10 groups of 2 cards each to describe each reaction control jet nozzle. If fewer than 10 nozzles are simulated, only $2\eta_{RJ}$ of these cards are necessary.				
$47+2(\eta-1)$	XR(14 $(\eta-1)+1$)	FS_{RJ}	Location and orientation of η^{th} RCS nozzle ($\eta \leq \eta_{RJ}$)	cm (in)
	2	BL_{RJ}		cm (in)
	3	WL_{RJ}		cm (in)
	4	ψ_{RJ}		deg
	5	θ_{RJ}		deg
	6		Controller for η^{th} nozzle (= 1:δ_S, = 2:δ_Y, = 3:δ_R	
	7	δ_o		cm (in)
$48+2(\eta-1)$	XR(14 $(\eta-1)+8$)	δ_D		cm (in)
	9	δ_{RAMP}	Constants used to describe	cm (in)
	10	T_{max_1}	T_R vs δ	N (lbs)
	11	T_{max_2}		N (lbs)
	12	τ_1	RCS thrust response time constants	sec
	13	τ_2		sec
	14	---	(not used)	
67	YL(1)	η_J	Number of vectorable jet nozzles (6 max)	
	2-7	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

The next 12 cards consist of 6 groups of 2 cards each to describe each vectorable nozzle jet associated with a lift or lift/cruise engine. If fewer than 6 nozzles are simulated, only $2\eta_J$ of these cards are necessary.

Card	FORTRAN	Variable	Description	Units
68+ 2(η-1)	XL(14 (η-1)+1)	FS_J	Location of η^{th} vectorable nozzle	cm (in)
	2	BL_J		cm (in)
	3	WL_J		cm (in)
	4	θ_J	Orientation of η^{th} nozzle (if J = 0, ϕ and θ are used; if J ≠ 0, ψ and θ are used)	deg
	5	ϕ_J		deg
	6	ψ_J		deg
	7	J	Orientation indicator	
69+ 2(η-1)	XL(14 (η-1)+8)	H_J	Angular momentum at max thrust (per nozzle)	$kg \cdot m^2/sec$ $(slug \cdot ft^2/sec)$
	9	ψ_H	Orientation of angular momentum vector	deg
	10	θ_H		deg
	11	A	Coefficients for H_J vs T_J	%
	12	B		%/N (lbs)
	13	C		$\%/N^2$ (lbs^2)
	14	---	(not used)	
80	XS(1)	$\Delta\alpha_H/i_s$	Control effectiveness parameters	
	2	$\Delta\alpha_W/\delta_a$		
	3	$\Delta\alpha_V/\delta_r$		
	4-7	---	(not used)	
81	8-14	---	(not used)	

TABLE II (Continued)
INPUT DATA VARIABLE LIST

Card	FORTRAN	Variable	Description	Units
82	15-21	---	(not used)	
83	22-28	---	(not used)	
84	TZERO	t_o	Initial time	sec
	ZDELT1	Δt_1	Integration interval for $t_o \leq t \leq t_1$ and $t_2 \leq t \leq t_3$	sec
	ZMAX1	t_1	End of first time interval	sec
	ZDELT2	Δt_2	Integration interval for $t_1 < t < t_2$	sec
	ZMAX2	t_2	End of second time interval	sec
	ZMAX3	t_3	End of third time interval	sec

Card(s) 85: Time History Control and Disturbance Inputs

Variables: NEXT, J, XCIT(1), . . . , XCIT(6)

Format: I1, I4, 5X, 6F10.0

NEXT is a test word which may be either 0 or 1. Up to 20 cards of this type may be used for a given run. All except the last of these cards should have NEXT = 1; the last card should have NEXT = 0. The allowable values of J and corresponding definitions of XCIT(I) are listed in Table III.

OUTPUT DESCRIPTION

Program output is categorized into seven sections. The first three sections are concerned with input data and the trim calculation and are always printed. The fourth section is printed following a stability analysis. The fifth section contains time history output data and the sixth and seventh sections are outputs of the print plot and curve fit options, respectively. Output for a sample run is presented in Appendix B and is referenced in the following discussion.

Input Data

All input data for a given case is grouped and printed as shown in figures B-3 and B-4. This provides a convenient reference for each computer run.

Trim Iteration Data

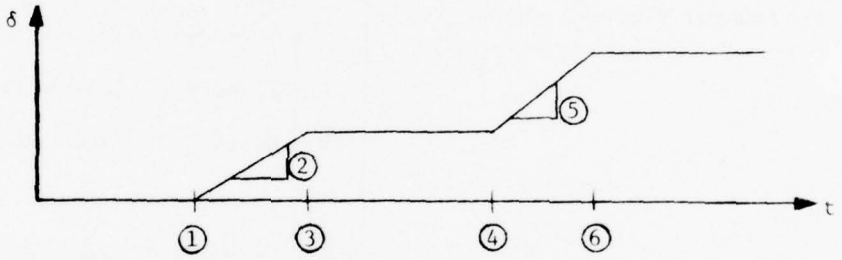
Figure B-5 is an example of the output produced for each trim iteration. The first line of data lists the current values for each of the six trim control variables, VAR(I). The units are percent or degrees as applicable. The next grouping of data presents the total vehicle forces and moments in body axes as well as a breakdown of the contributions of each major component: right wing, left wing, horizontal stabilizer, fuselage, right and left fixed nozzles, RCS, vectorable nozzles, inlet momentum, vertical stabilizer, weight, engine angular momentum and propulsion induced aerodynamics. Units for this matrix are newtons and newton·meters. Immediately following this matrix is the normalized Jacobian. This matrix provides an indication of relative forces and moments produced by motion of each of the trim controls. The last two lines on this page of output show the correction ratios applied to the predicted control increments if any of them have exceeded the specified maximum, Δx_i.

Trim Output Summary

Once a trim solution has been reached, all pertinent parameters are summarized on one page of output (figure B-7). All data on this page are in standard units (newtons, metres, degrees, seconds) as applicable unless otherwise noted.

TABLE III
CONTROL AND DISTURBANCE INPUT DEFINITIONS

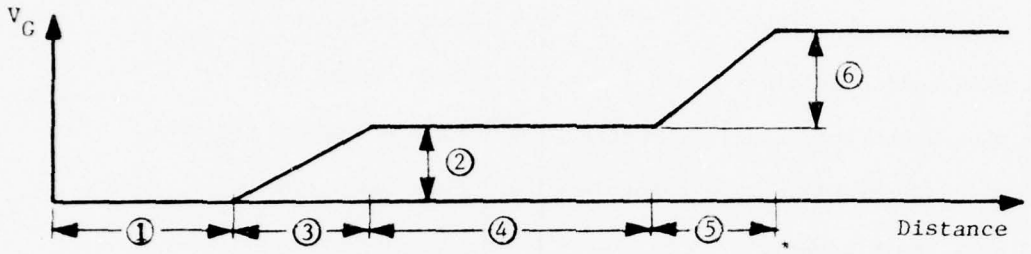
J	Description	I	XCIT (I)
1	Move fixed nozzle engine throttle	1	Start time, sec
2	Move longitudinal stick	2	Rate 1, cm/sec (in/sec)
3	Move lateral stick	3	Stop time, sec
4	Move rudder pedals	4	Start time, sec
5	Move vectorable nozzle throttle 1	5	Rate 2, cm/sec (in/sec)
6	Move vectorable nozzle throttle 2	6	Stop time, sec
7	Move angle lever 1		
8	Move angle lever 2		



9	Vertical ramp gust	1	Distance to start of gust, m (ft)
11	Horizontal ramp gust	2	Max gust velocity, m/sec (ft/sec), (+ down or North)
		3	First ramp length, m (ft)
		4	Distance gust is steady, m (ft)
		5	Second ramp length, m (ft)
		6	Incremental gust velocity, m/sec (ft/sec)

TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)



10	Vertical $(1\text{-}\cos^2)$ gust
12	Horizontal $(1\text{-}\cos^2)$ gust

1	Distance to start of gust, m (ft)
2	First gust velocity, m/sec (ft/sec), (+down or North)
3	First gust length, m (ft)
4	Distance between gusts, m (ft)
5	Second gust length, m (ft)
6	Second gust velocity, m/sec (ft/sec)

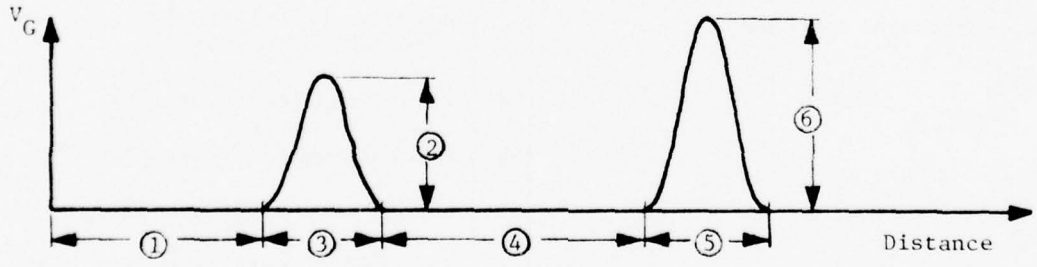


TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
13	Change wing flap deflection	1	Start time, sec
		2	Rate 1, deg/sec
		3	Stop time, sec
		4	Start time, sec
		5	Rate 2, deg/sec
		6	Stop time, sec
14	Vary fixed nozzle engine thrust	1	Start time, sec
		2	Index (see 4 and 5)
		3	Rate, N/sec (lb/sec)
		4	Stop time, sec (index = 0)
		5	Final thrust value, N (lbs), (index $\neq$ 0)
		6	= 1: left jet, = 2: right jet
15	Vectorable nozzle engine thrust failure	1	Start time, sec
		2	Stop time, sec (thrust = 0)
		3	Nozzle number (1 to 6)
		4-6	(not used)
17	Yaw damper	1	Start time, sec
		2	Yaw rate gain, K_r, cm/deg/sec, (in/deg/sec)
		3	Stop time, sec
		4	Time lag, τ, sec
		5-6	(not used)
18	Roll damper and attitude hold (ϕ= 0)	1	Start time, sec
		2	Attitude gain, K_ϕ, cm/deg (in/deg)
		3	Rate gain, K_p, cm/deg/sec (in/deg/sec)

TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
		4	Stop time, sec
		5	Time lag for both feedbacks, τ, sec
		6	(not used)
19	Pitch damper and attitude hold ($\theta = \theta_o$)	1	Start time, sec
		2	Attitude gain, K_θ, cm/deg (in/deg)
		3	Rate gain, Kq, cm/deg/sec (in/deg/sec)
		4	Reference attitude, θ_o, deg
		5	Stop time, sec
		6	Time lag for both feedbacks, τ, sec
20	Sinusoidal control movement	1	Start time, sec
		2	Frequency, Hz
		3	Amplitude, cm (in)
		4	Stop time, sec
		5	Control to be moved 1: δ_T 5: δ_{T_1} 2: δ_S 6: δ_{T_2} 3: δ_Y 7: δ_{θ_1} 4: δ_R 8: δ_{θ_2}
		6	(not used)
31	Change time history output print frequency	1	Time, sec
		2	New NPRINT
		3	Time, sec

TABLE III (Continued)
CONTROL AND DISTURBANCE INPUT DEFINITIONS

J	Description	I	XCIT (I)
		4	New NPRINT
		5	Time, sec
		6	New NPRINT

Stability Analysis Output

If a stability analysis is requested, the force and moment derivatives for each of the eight control variables and three vehicle attitudes are printed as shown in figure B-8. The first matrix is in units of newtons or newton·metres per centimetre of control or radian of angle. The elements of the second matrix are normalized by vehicle mass for the force derivatives and vehicle moment of inertia for each of the moment derivatives.

Results of the finite difference calculations for the stability derivatives are printed as shown in figures B-9 through B-11. Here the values of VAR(I) are u, w, q, v, p, and r each of which is incremented in turn. The resulting forces and moments (both total and incremental) are printed in units of newtons and newton·metres. The stability derivatives are calculated by dividing each incremental force and moment by the appropriate velocity increment. The results are summarized as shown in figure B-12. Again the second matrix has been normalized by mass and inertia.

The small perturbation stabilty analysis output is presented on two pages: longitudinal characteristics (figure B-13) and lateral/directional characteristics (figure B-14). The output format for both is identical with the coefficients of the small perturbation equations printed first. Following this are the roots of the characteristic equations and their associated periods, natural frequencies, damping and times to halve or double. The last set of data is the roots and gains of the major transfer function numerators. The gains are in units of metres/second, radians and radians/second per centimetre of control deflection.

Time History Output

During a time history calculation, at the specified print-out interval, the aircraft state is summarized as it was for trim (figure B-15).

Time History Plotting

Figure B-16 is a portion of a sample time history print plot output. Up to three dependent variables are presented versus time with symbol notation and scaling as indicated on the plot. Time in seconds is scaled down the left margin.

Curve Fit Output

Typical output from the least squares curve fit option is presented in figures B-17 and B-18. The output is self-explanatory with the possible exception of "COEF OF CORR" which gives an indication of the accuracy of the particular curve fit (a value of one represents an exact fit).

40

REFERENCES

(a) Anonymous, "Metric Practice Guide," ASTM E 380-74, 24 February 1975.

(b) Livingston, Charles L., "A Stability and Control Prediction Method for Helicopters and Stoppable Rotor Aircraft," Air Force Flight Dynamics Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio, AFFDL-TR-69-123, Volumes 1 through 4, February 1970.

A P P E N D I X A

Program Listing

```
      PROGRAM VSTOL (INPUT,OUTPUT,TAPE3,TAPE5=INPUT,TAPE6=OUTPUT,TAPE1)  VSTL0001
C                                                                        VSTL0002
C                        N.A.D.C. VSAC PROGRAM                           VSTL0003
C           JET-LIFT V/STOL STABILITY AND CONTROL ANALYSIS               VSTL0004
C                                                                        VSTL0005
C                        PROGRAM CONTROL SECTION                         VSTL0006
C     THIS PROGRAM DEPENDS UPON THE VALUE OF NPART FIRST TO DETERMINE    VSTL0007
C       ITS EXECUTION PROCESS.                                           VSTL0008
C     WHEN TWO VALUES OF NPART USE THE SAME SUBROUTINES THE PATHS TAKEN  VSTL0009
C        IN THE SUBROUTINES ARE DIFFERENT DEPENDING UPON THE VALUES OF   VSTL0010
C        THE OTHER VARIABLES IN THE PROBLEM.                             VSTL0011
C     NPART = 1 - TRIM ONLY                                              VSTL0012
C             2 - TRIM,STABILITY ANALYSIS AND TIME HISTORY               VSTL0013
C             3 - PRINTER PLOTS                                          VSTL0014
C             4 - CALCOMP PLOTS                                          VSTL0015
C             5 - NOT USED                                               VSTL0016
C             6 - REVISE DATA AND RUN AS FOR NPART=2                     VSTL0017
C             7 - TRIM AND STABILITY ANALYSIS                            VSTL0018
C             8 - NOT USED                                               VSTL0019
C             9 - REVISE DATA AND RUN TRIM AND STABILITY ANALYSIS        VSTL0020
C            10 - SAME AS NPART=9 USING PREVIOUS TRIM AS START VALUES     VSTL0021
C            11 - LEAST SQUARES CURVE FIT OF TIME HISTORY                VSTL0022
C                                                                        VSTL0023
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                    VSTL0024
     1                NPART,NVARA,NVARB,NVARC,NSCALE                     VSTL0025
     1                ,NVARS,NPRINT,NTIME                                VSTL0026
C *THE FOLLOWING SET SIZE ALLOCATIONS FOR COMMON BLOCKS*                  VSTL0027
      COMMON /CONTR/  CON(44)                                            VSTL0028
      COMMON /FORCE/  FOR(74)                                            VSTL0029
      COMMON /FORY/   FORY(600)                                          VSTL0030
      COMMON /KVARTR/ KVA(75)                                            VSTL0031
      COMMON /LJETS/  XLJE(130)                                          VSTL0032
      COMMON /MANAL/  XMANA(47)                                          VSTL0033
      COMMON /MANARO/ XMAN(43)                                           VSTL0034
      COMMON /PLOTD/  PLO(420)                                           VSTL0036
      COMMON /RJETS/  RJE(128)                                           VSTL0037
      COMMON /ROMAN/  ROM(23)                                            VSTL0038
      COMMON /STAMAN/ STAM(30)                                           VSTL0039
      COMMON /STANRO/ STA(13)                                            VSTL0040
      COMMON /STARAN/ STAR(145)                                          VSTL0041
      COMMON /STRD/   STR(48)                                            VSTL0042
      COMMON /STRIAH/ STR(784)                                           VSTL0043
      COMMON /STRIMA/ STRI(202)                                          VSTL0044
      COMMON /TRONIC/ TRO(94)                                            VSTL0045
C                                                                        VSTL0046
      DIMENSION IDUM(266)                                                VSTL0047
      WRITE(6,230)                                                       VSTL0048
      CALL WROT1                                                         VSTL0049
      NPLOT=0                                                            VSTL0050
      NVARS=0                                                            VSTL0051
      EXIT=2.                                                            VSTL0052
      AH(2)=0.                                                           VSTL0053
   13 CONTINUE                                                           VSTL0054
      READ (5,220)        NPART,NPRINT,NSCALE,NVARA,AL(1),AH(1),         VSTL0055
     1                     NVARB,AL(2),AH(2),NVARC,AL(3),AH(3)           VSTL0056
```

```
      IF(EOF(5))190,20                                                  VSTL0057
   20 IF(NPART.GT.11.OR.NPART.LT.1) GO TO 180                           VSTL0058
      IF(EXIT.NE.0..AND.NPART.EQ.10) GO TO 190                          VSTL0059
      NTIME=-1                                                          VSTL0060
      IF(NPRINT.LE.0) NPRINT=1                                          VSTL0061
      EXIT=0.                                                           VSTL0062
      GOTO (30,40,120,130,180,140,150,180,160,160,170),NPART            VSTL0063
   30 CONTINUE                                                          VSTL0064
      CALL START                                                        VSTL0065
      IF(EXIT.NE.0.) GO TO 13                                           VSTL0066
      CALL TRIM                                                         VSTL0067
      IF(EXIT.NE.0.) GO TO 13                                           VSTL0068
      CALL INIT                                                         VSTL0069
      GO TO 13                                                          VSTL0070
   40 CONTINUE                                                          VSTL0071
      CALL START                                                        VSTL0072
      IF(EXIT.NE.0.) GO TO 60                                           VSTL0073
      CALL TRIM                                                         VSTL0074
      IF(EXIT.NE.0.) GO TO 60                                           VSTL0075
   50 CONTINUE                                                          VSTL0076
      CALL MANU                                                         VSTL0077
      IF(EXIT.NE.0..OR.NVARS.EQ.0) GO TO 13                             VSTL0078
      CALL STAR                                                         VSTL0079
      IF(EXIT.EQ.0.) GO TO 50                                           VSTL0080
      A4=99999999.                                                      VSTL0081
      WRITE (3) IPSN,A4,IDUM                                            VSTL0082
      GO TO 13                                                          VSTL0083
   60 CONTINUE                                                          VSTL0084
      READ (5,220)          NPART,NPRINT,NSCALE,NVARA,AL(1),AH(1),      VSTL0085
     1                       NVARB,AL(2),AH(2),NVARC,AL(3),AH(3)        VSTL0086
      IF(EOF(5))190,70                                                  VSTL0087
   70 CONTINUE                                                          VSTL0088
      IF(NPART.EQ.3.OR.NPART.EQ.8) GO TO 60                             VSTL0089
      IF(NPART.EQ.10) GO TO 190                                         VSTL0090
      IF(NPART.EQ.11) GO TO 80                                          VSTL0091
      GO TO 20                                                          VSTL0092
   80 READ (5,200) (IDUM(II),II=1,NVARA)                               VSTL0093
      IF(NVARB.EQ.0) GO TO 100                                          VSTL0094
      DO 90 IJ=1,NVARB                                                  VSTL0095
      READ (5,200) NNUM,ND,(IDUM(II),II=1,NNUM)                         VSTL0096
   90 CONTINUE                                                          VSTL0097
  100 CONTINUE                                                          VSTL0098
      ND=AL(2)+.1                                                       VSTL0099
      IF(ND.EQ.0) GO TO 60                                              VSTL0100
      DO 110 IJ=1,ND                                                    VSTL0101
      READ (5,200) (IDUM(II),II=1,3)                                    VSTL0102
  110 CONTINUE                                                          VSTL0103
      GO TO 60                                                          VSTL0104
  120 CONTINUE                                                          VSTL0105
      REWIND 3                                                          VSTL0106
      CALL PPLOT                                                        VSTL0107
      GO TO 13                                                          VSTL0108
  130 CONTINUE                                                          VSTL0109
      REWIND 3                                                          VSTL0110
      CALL CPLOT(NPLOT)                                                 VSTL0111
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      GOTO 13                                                          VSTL0112
  140 CONTINUE                                                         VSTL0113
      NVARS=0                                                          VSTL0114
      GOTO 40                                                          VSTL0115
  150 CONTINUE                                                         VSTL0116
      CALL START                                                       VSTL0117
      IF(EXIT.NE.0.) GO TO 13                                          VSTL0118
      CALL TRIM                                                        VSTL0119
      CALL INIT                                                        VSTL0120
      CALL STAB                                                        VSTL0121
      GO TO 13                                                         VSTL0122
  160 CONTINUE                                                         VSTL0123
      CALL START                                                       VSTL0124
      IF(EXIT.NE.0.) GO TO 190                                         VSTL0125
      CALL TRIM                                                        VSTL0126
      IF(EXIT.NE.0.) GO TO 190                                         VSTL0127
      CALL INIT                                                        VSTL0128
      IF(NVARA.NE.0) CALL STAB                                         VSTL0129
      IF(EXIT.NE.0.) GO TO 190                                         VSTL0130
      GO TO 13                                                         VSTL0131
  170 CONTINUE                                                         VSTL0132
      REWIND 3                                                         VSTL0133
      CALL CURVFT                                                      VSTL0134
      GO TO 13                                                         VSTL0135
  180 WRITE (6,210)NPART                                               VSTL0136
  190 IF(NPLOT.NE.0) CALL PLOT(10.,10.,999)                            VSTL0137
      STOP                                                             VSTL0138
  200 FORMAT (14I5)                                                    VSTL0139
  210 FORMAT (1H1,46X,*V/STOL-AIRCRAFT RIGID BODY DYNAMIC ANALYSIS*/////VSTL0140
     2       23H DATA ERROR .. NPART = ,I5)                            VSTL0141
  220 FORMAT (I2,2I4,         3(I5,5X,2F5.0))                          VSTL0142
  230 FORMAT (1H1)                                                     VSTL0143
      END                                                              VSTL0144
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      SUBROUTINE AJACOB                                                AJAC0001
      COMMON /FORCE/  XF,T1(12),YF,T2(9),ZF,T3(11),                    AJAC0002
     1                QL,T4(12),QM,T5(12),QN                           AJAC0003
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,      AJAC0004
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RHO,R12,SPD(6,6,1),   AJAC0005
     2                T6(230),XCON(63)                                 AJAC0006
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,   AJAC0007
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),   AJAC0008
     2                TIME,TMAX,XCIT(20,6),ALGE2,ALGE1,ALGE2,CGSTA,    AJAC0009
     3                T7(28),ALGE3                                     AJAC0010
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,     AJAC0011
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE, AJAC0012
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL, AJAC0013
     3                T8(15),ALECR1,ALGFPD                             AJAC0014
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1      AJAC0015
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,AJAC0016
     1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD,  AJAC0017
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     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE                AJAC0018
      COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,       AJAC0019
     1                PILGH2,PWGEL1                                         AJAC0020
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN                        AJAC0021
      COMMON /RJETS/  NJETR,XSTK(3),XU(10),XD(10),XR(10),TPOS(10)           AJAC0022
      COMMON /CONTR/ ADISP(3),APRATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)    AJAC0023
     1               ,NTRIM                                                 AJAC0024
      DIMENSION VAR(11)                                                     AJAC0025
      EQUIVALENCE (VAR(1),COLSTK)                                           AJAC0026
      CYCR1=CYSTK1*CYCF(3)+CYCF(2)                                          AJAC0027
      CYCH2=CYSTK2*CYCL(3)+CYCL(2)                                          AJAC0028
      PED= PEDAL*PEDA(3)+PEDA(2)                                            AJAC0029
      WGCOL=AGW                                                             AJAC0030
      XSTK(1)=CYCR1*DTRR                                                    AJAC0031
      XSTK(2)=CYCR2*DTRR                                                    AJAC0032
      XSTK(3)=PED*PEDA(1)/(PEDA(3)*100.)                                    AJAC0033
      ALGE3=XCON(26)/(DTRR*2.)                                              AJAC0034
      ADISP(1)=AYE*DTRR                                                     AJAC0035
      ADISP(2)=APE*DTRR                                                     AJAC0036
      ADISP(3)=ARE*DTRR                                                     AJAC0037
      ARATE(1)=AYD*DTRR                                                     AJAC0038
      ARATE(2)=APD*DTRR                                                     AJAC0039
      ARATE(3)=ARD*DTRR                                                     AJAC0040
      NTRIM1=NTRIM                                                          AJAC0041
      IF(LINK.EQ.3) NTRIM1=1                                                AJAC0042
      CALL CONTRL(NTRIM1)                                                   AJAC0043
   10 NTRIM=NTRIM1                                                          AJAC0044
      IF(LINK.EQ.3) NTRIM =2                                                AJAC0045
      DELALE=DELTA(1)*XSYS(1)                                               AJAC0046
      ALECR1=ALGE2*DELALE                                                   AJAC0047
      DELAIL=DELTA(2)*XSYS(2)                                               AJAC0048
      ALCYP=DELAIL                                                          AJAC0049
      DELRUD=DELTA(3)*XSYS(3)                                               AJAC0050
      ALGERD=ALGE*DELRUD                                                    AJAC0051
      CALL VR3D (XXD,YYD,ZZD,AYE,APE,ARE,VXB,VYB,VZB,-1)                    AJAC0052
      IF(LINK.EQ.2) CALL OFFTRM                                             AJAC0053
C                                                                           AJAC0054
      CALL ANAL                                                             AJAC0055
C                                                                           AJAC0056
      IF(EXIT.NE.0.) RETURN                                                 AJAC0057
      F(1) = XF - DX                                                        AJAC0058
      F(2) = YF - DY                                                        AJAC0059
      F(3) = ZF - DZ                                                        AJAC0060
      F(4) = QN - DN                                                        AJAC0061
      F(5) = QM - DM                                                        AJAC0062
      F(6) = QL - DL                                                        AJAC0063
      IF(COND1.LE.1.5.AND.J.NE.1) RETURN                                    AJAC0064
      IF(COND1.LE.1.5.AND.LINK.EQ.3) RETURN                                 AJAC0065
      IF(COND1.EQ.0.) RETURN                                                AJAC0066
      CALL WRVP (1,VAR,KM1,PD,TAXL,TAXR)                                    AJAC0067
      CALL WRFM                                                             AJAC0068
      RETURN                                                                AJAC0069
      END                                                                   AJAC0070
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      SUBROUTINE ANAL                                                   ANAL0001
      COMMON /FORCE/  XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,    ANAL0002
     1                XFLJ,XFGUN,XFFIN,XFW,XADD,                        ANAL0003
     2                YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW, ANAL0004
     D                YADD,                                             ANAL0005
     3                ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,    ANAL0006
     4                ZFLJ,ZFGUN,ZFW,ZADD,                              ANAL0007
     5                QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,RMRJ,RMLJ,LGUN,ANAL0008
     A                LFIN,RGYRO,RMADD,                                 ANAL0009
     6                QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN,ANAL0010
     B                MFIN,PGYRO,PMADD,                                 ANAL0011
     7                QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN,ANAL0012
     C                NFIN,YGYRO,YMADD                                  ANAL0013
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,      ANAL0014
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,  ANAL0015
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,  ANAL0016
     3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,  ANAL0017
     4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,      ANAL0018
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1         ANAL0019
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,ANAL0020
     1                YGUSTF,GFWD,GLAT,GVERT,VXH,VZB,APD,VYH,ARD,AYD,   ANAL0021
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE            ANAL0022
     3               ,TLSTK(2),THLSTK(2),DUM(6),DFLAP1                  ANAL0023
      COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,   ANAL0024
     1                PILGH2,PWGEL1                                     ANAL0025
      COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLRO,CNRO,ETAQ,NJET, ANAL0026
     1                QFIN,CLBCL,YFS(14),CNRCL,CNPCL,CNRCD,CNRCL,COLKS, ANAL0027
     2                D3ELE,FNSWC,LWING,RPIST,YAERO(31,3),APRJET,ARBJET,ANAL0028
     3                AYBJET,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETAQMX, ANAL0029
     4                PWGWK1,RCWING,SWINGH,ANGR,ANGL,DFLAP              ANAL0030
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                   ANAL0031
     1                NPART,NVARA,NVARB,NVARC,NSCALE                    ANAL0032
     1                ,NVARS,NPRINT,NTIME                               ANAL0033
      COMMON /FORY/   Y(4,150)                                          ANAL0034
      COMMON /RJETS/  NJETR,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),      ANAL0035
     1                TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),        ANAL0036
     2                AYBJTR(10),APBJTR(10),JTRCON(10)                  ANAL0037
     3               ,XACT,TPCTA,TPCTB                                  ANAL0038
      COMMON /LJETS/  NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6),    ANAL0039
     1                ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2)      ANAL0040
     2               ,AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6),      ANAL0041
     3                ANGA(6),ANGB(6),TLJET(6),ANGC(6)                  ANAL0042
      COMMON /STRIAB/ TEMP(240),XFS(35),TEMP1(49),YWG(21),YEL(21),      ANAL0043
     1          YFN(21)                                                 ANAL0044
      COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARBG,ASEP,AYBG,CGRL,DPIX,DPIZ, ANAL0045
     1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,RMASS,   ANAL0046
     2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R, ANAL0047
     3                P010TR,RDELT1,RDELT2                              ANAL0048
      REAL LELE,LFIN,LGUN,LLJET,LLWG,LRJET,LRWG,LFUS,                   ANAL0049
     1     MELE,MFIN,MGUN,MLJET,MLWG,MRJET,MRWG,MFUS,MFFUS,             ANAL0050
     2     NELE,NFIN,NGUN,NLJET,NLWG,NRJET,NRWG,NFUS,NFFUS              ANAL0051
      DS=10./57.2958                                                    ANAL0052
      DFLAP=DFLAP1                                                      ANAL0053
      WP=W*COS(APE)                                                     ANAL0054
      XFW=-W*SIN(APE)                                                   ANAL0055
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      YFW=WP*SIN(ARE)                                                    ANAL0056
      ZFW=WP*COS(ARE)                                                    ANAL0057
   10 XMAC=V*VSND                                                        ANAL0058
      AP=0.                                                              ANAL0059
      APDOT=0.                                                           ANAL0060
      VXZBSQ=VXB**2+VZB**2                                               ANAL0061
      IF(VXZBSQ.EQ.0.) GO TO 20                                          ANAL0062
      AP=ATAN2(VZB,VXB)                                                  ANAL0063
      APDOT=(VXB*Y(1,78)-VZB*Y(1,76))/VXZBSQ                             ANAL0064
C     WING EQUATIONS                                                     ANAL0065
   20 CONTINUE                                                           ANAL0066
      ANGE=0.                                                            ANAL0067
      IF(QWG.LT.0) GO TO 50                                              ANAL0068
      XXW=VXB-YGUSTW+APD*ZAWG                                            ANAL0069
      ST1=VZB-VGUSTW-APD*XAWG                                            ANAL0070
      ANGRW=0.                                                           ANAL0071
      IF(XXW.NE.0..OR.ST1.NE.0.) ANGRW=ATAN2(ST1,XXW)                    ANAL0072
      ALGEO=ANGRW+WGCOL                                                  ANAL0073
      ALRWG=ALGEO-ALCYP                                                  ANAL0074
      CALL CLCD (ALRWG,CLRWG,CDRWG,XMAC,EXIT,1)                          ANAL0075
      IF(EXIT.NE.0.) GO TO 150                                           ANAL0076
      CD=C3                                                              ANAL0077
      CL=C4                                                              ANAL0078
      DCDR=DCD                                                           ANAL0079
      VELSQ=XXW**2+ST1**2                                                ANAL0080
      QRW=QWG*VELSQ                                                      ANAL0081
      CALL VR2D (-CDRWG,-CLRWG,ANGRW,C1,C2,1)                            ANAL0082
      XFRWG=C1*QRW                                                       ANAL0083
      ZFRWG=C2*QRW                                                       ANAL0084
      CALL XPRO (XAWG,YARWG,ZAWG,XFRWG,0.    ,ZFRWG,LRWG,MRWG,NRWG)      ANAL0085
      MRWG=MRWG+YWG(21)*DFLAP*QRW*YAERO(10,1)+YWG(15)*QRW*YAERO(10,1)    ANAL0086
      ALLWG=ALGEO+ALCYP                                                  ANAL0087
      CALL CLCD (ALLWG,CLLWG,CDLWG,XMAC,EXIT,1)                          ANAL0088
      IF(EXIT.NE.0.) GO TO 150                                           ANAL0089
      CD=.5*(C3+CD)                                                      ANAL0090
      CLWG=.5*(C4+CL)                                                    ANAL0091
      ALWG=.5*(ALRWG+ALLWG)                                              ANAL0092
      DCD=.5*(DCDR+DCD)                                                  ANAL0093
      CALL VR2D (-CDLWG,-CLLWG,ANGRW,C1,C2,1)                            ANAL0094
      XFLWG=C1*QRW                                                       ANAL0095
      ZFLWG=C2*QRW                                                       ANAL0096
      CALL XPRO (XAWG,YALWG,ZAWG,XFLWG,0.    ,ZFLWG,LLWG,MLWG,NLWG)      ANAL0097
      MLWG=MLWG+YWG(21)*DFLAP*QRW*YAERO(10,1)+YWG(15)*QRW*YAERO(10,1)    ANAL0098
      TS=0.                                                              ANAL0099
      IF(VELSQ.NE.0.) TS=SWINGH/SQRT(VELSQ)                              ANAL0100
      FF=QRW*SWING                                                       ANAL0101
      YAW=0.                                                             ANAL0102
      XZW=SQRT(VELSQ)                                                    ANAL0103
      IF(VYB-YGUSTW.NE.0..OR.XZW.NE.0.) YAW=ATAN2(VYB-YGUSTW,XZW)        ANAL0104
C     DQL AND DQN ARE CONTRIBUTION OF EACH WING, NOT TOTAL               ANAL0105
      DQL=FF*(YAW*(CLBO+CLRCL*CLWG)+TS*(AYD*CLR*CLWG+ARD*CLP))           ANAL0106
      DQN=FF*(YAW*(CNBO+CNRCL*CLWG**2)+TS*(AYD*(CNRCL*CLWG**2+CNRCD*CD)  ANAL0107
     1   +ARD*(CNPCL*CLWG+CNPCD1*DCD)))                                  ANAL0108
      CALL VR2D (DQL,DQN,ANGRW,DQL,DQN,1)                                ANAL0108
      LRWG=LRWG+DQL                                                      ANAL0109
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      LLWG=LLWG+DQL                                                    ANAL0110
      NRWG=NRWG+DQN                                                    ANAL0111
      NLWG=NLWG+DQN                                                    ANAL0112
      ANGE=-PWGWK1*CLWG                                                ANAL0113
      IF(ABS(ALWG).GT.1.5780) ANGE=0.                                  ANAL0114
      ANG1=0.                                                          ANAL0115
      IF(VXB.GE.50.) ANG1=APDOT*XAELE*PWGEL1/VXB                       ANAL0116
      IF(ALWG.EQ.0.) GO TO 30                                          ANAL0117
      ANGE=ANGE-ANG1*(CLWG-YWG(19)*DFLAP)/ALWG                         ANAL0118
      GO TO 40                                                         ANAL0119
   30 CONTINUE                                                         ANAL0120
      ANGE=ANGE-ANG1*YAERO(17,1)                                       ANAL0121
   40 CONTINUE                                                         ANAL0122
      AWAKE=PWGWK1*CLWG                                                ANAL0123
      XA=DXWGEL                                                        ANAL0124
      AWGEL=ATAN2(DZWGEL,XA)                                           ANAL0125
      DWGEL=SQRT(XA**2+DZWGEL**2)*RCWING                               ANAL0126
      ANGLE=AWAKE-AP+AWGEL                                             ANAL0127
      DIS =DWGEL*ABS(SIN(ANGLE))                                       ANAL0128
      XI=DWGEL*ABS(COS(ANGLE))                                         ANAL0129
      HWAKE=.68*SQRT(CD*(XI+.15))                                      ANAL0130
      ETAQ=0.                                                          ANAL0131
      IF(DIS .LT.HWAKE .AND. ABS(ANGLE).LT.HALFPI)                     ANAL0132
     1   ETAQ=ETAQMX*SQRT(CD)/(XI+.3)*(COS(DIS *HALFPI/HWAKE))**2      ANAL0133
C     ELEVATOR EQUATIONS                                               ANAL0134
   50 IF(QELE.LT.0) GO TO 60                                           ANAL0135
      ST1=VZB+APD*YAELE-APD*XAELE-VGUSTE                               ANAL0136
      XXE=VXB+APD*ZAELE-AYD*YAELE-HGUSTE                               ANAL0137
      VELSQ=XXE**2+ST1**2                                              ANAL0138
      IF(VELSQ.NE.0.) ANGF=ATAN2(ST1,XXE)+ANGE                         ANAL0139
      ALEL=ALECR1+ANGE                                                 ANAL0140
      CALL CLCD (ALEL,CLELF,CDELE,XMAC,EXIT,2)                         ANAL0141
      IF(EXIT.NE.0.) GO TO 150                                         ANAL0142
      QE=QELE*VELSQ*(1.-ETAQ)                                          ANAL0143
      CALL VR2D (-CDELE,-CLELE,ANGE,C1,C2,1)                           ANAL0144
      XFELE=C1*QE                                                      ANAL0145
      ZFELE=C2*QE                                                      ANAL0146
      CALL XPRO (XAELE,YAELE,ZAELE,XFELE,0.    ,ZFELE,LELE,MELE,NELE)  ANAL0147
      MELE=MELE+YEL(15)*QE*YAERO(10,2)                                 ANAL0148
C     FIN EQUATIONS                                                    ANAL0149
   60 IF(QFIN.LT.0) GO TO 70                                           ANAL0150
      ST1=ARD*ZAFIN-AYD*XAFIN-VYB*FNSWC+YGUSTF                         ANAL0151
      XXFN=VXB+APD*ZAFIN-AYD*YAFIN-HGUSTF                              ANAL0152
      QF=QFIN*(XXFN*XXFN+ST1*ST1)                                      ANAL0153
      ANGF=0.                                                          ANAL0154
      IF(QF.NE.0.) ANGF=ATAN2(ST1,XXFN)                                ANAL0155
      ALFIN=ANGF+ALGFPD                                                ANAL0156
      CALL CLCD (ALFIN,CLFIN,CDFIN,XMAC,EXIT,3)                        ANAL0157
      IF(EXIT.NE.0.) GO TO 150                                         ANAL0158
      CALL VR2D (-CDFIN,CLFIN,ANGF,C1,C2,-1)                           ANAL0159
      XFFIN=C1*QF                                                      ANAL0160
      YFFIN=C2*QF                                                      ANAL0161
      CALL XPRO (XAFIN,YAFIN,ZAFIN,XFFIN,YFFIN,0.    ,LFIN,MFIN,NFIN)  ANAL0162
      NFIN=NFIN+YFN(15)*QF*YAERO(10,3)                                 ANAL0163
C     FUSELAGE EQUATIONS                                               ANAL0164
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   70 XXF=VXB-HGUST                                                        ANAL0165
      ST1=VZH-VGUST                                                        ANAL0166
      ANG1=0.                                                              ANAL0167
      QVXZB=Q*(XXF*XXF+ST1*ST1)                                            ANAL0168
      IF(QVXZB.NE.0.) ANG1=ATAN2(ST1,XXF)                                  ANAL0169
      AP=ANG1                                                              ANAL0170
      S1=SIN(ANG1-YFS(1))                                                  ANAL0171
      FSLIFT=QVXZH*(XFS(16)*SIGN(1.,S1)*ABS(S1)**XFS(17))                  ANAL0172
      ST2=YGUST-VYB                                                        ANAL0173
      QVXYB=Q*(XXF*XXF+ST2*ST2)                                            ANAL0174
      ANG2=0.                                                              ANAL0175
      IF(QVXYB.NE.0.) ANG2=ATAN2(ST2,XXF)                                  ANAL0176
      S1=SIN(ANG2)                                                         ANAL0177
      YFFS=QVXYB*(XFS(21)*SIGN(1.,S1)*ABS(S1)**XFS(22))                    ANAL0178
      ANG3=0.                                                              ANAL0179
      QVXYZ=Q*(XXF**2+ST2**2+ST1**2)                                       ANAL0180
      IF(QVXYZ.NE.0.) ANG3=ATAN2(SQRT(ST1**2+ST2**2),XXF)                  ANAL0181
      S1=COS(ANG3)                                                         ANAL0182
      DF=QVXYZ*(XFS(18)*SIGN(1.,S1)*ABS(S1)**XFS(20))                      ANAL0183
      ZFFUS=-FSLIFT                                                        ANAL0184
      YFFUS=YFFS                                                           ANAL0185
      XFFUS=-DF                                                            ANAL0186
      CALL XPRO (XAFUS,YAFUS,ZAFUS,XFFUS,YFFUS,ZFFUS,LFUS,MFFUS,NFFUS)     ANAL0187
      IF(ABS(ANG1-YFS(1)).GT.YFS(2)) GOTO 90                               ANAL0188
      S1=SIN(3.14159*(ANG1-YFS(1))/(YFS(2)-YFS(1)))                        ANAL0189
      IF(((ANG1-YFS(1)-D5).GT.0.).OR.((ANG1-YFS(1)+D5).LT.0.)) GOTO 80     ANAL0190
      S1=SIN(3.14159*D5/(YFS(2)-YFS(1)))                                   ANAL0191
      MF1=QVXZH*XFS(24)*(ABS(S1)**XFS(25))                                 ANAL0192
      MFUS=2.*MF1*(ANG1-YFS(1)+D5)/(2.*D5)-MF1+MFFUS                       ANAL0193
      GOTO 100                                                             ANAL0194
   80 MFUS=QVXZH*(XFS(24)*SIGN(1.,SIN(ANG1-YFS(1)))*ABS(S1)**XFS(25))      ANAL0195
     1          +MFFUS                                                    ANAL0196
      GOTO 100                                                             ANAL0197
   90 S1=SIN(3.14159*(ABS(ANG1-YFS(1))-YFS(2)+YFS(1))/(3.14159+YFS(1)      ANAL0198
     1          -YFS(2)))                                                 ANAL0199
      MFUS=QVXZH*(XFS(26)*SIGN(1.,SIN(ANG1-YFS(1)))*ABS(S1)**XFS(27))      ANAL0200
     1          +MFFUS                                                    ANAL0201
  100 IF(ABS(ANG2).GT.YFS(3)) GOTO 120                                     ANAL0202
      S1=SIN(3.14159*ANG2/YFS(3))                                          ANAL0203
      IF(((ANG2-D5).GT.0.).OR.((ANG2+D5).LT.0.)) GOTO 110                  ANAL0204
      S1=SIN(3.14159*D5/YFS(3))                                            ANAL0205
      NF1=QVXYB*XFS(29)*(ABS(S1)**XFS(30))                                 ANAL0206
      NFUS=2.*NF1*(ANG2+D5)/(2.*D5)-NF1+NFFUS                              ANAL0207
      GOTO 130                                                             ANAL0208
  110 NFUS=QVXYB*(XFS(29)*SIGN(1.,S1)*ABS(S1)**XFS(30))+NFFUS              ANAL0209
      GOTO 130                                                             ANAL0210
  120 S1=SIN(3.14159*(ABS(ANG2)-YFS(3))/(3.14159-YFS(3)))                  ANAL0211
      NFUS=QVXYB*(XFS(31)*SIGN(1.,SIN(ANG2))*ABS(S1)**XFS(32))+NFFUS       ANAL0212
  130 CONTINUE                                                             ANAL0213
C      JET THRUST EQUATIONS                                                ANAL0214
      IF(COLJET.EQ.0.) GO TO 140                                           ANAL0215
      DCOL=COLJET*(COLSTK-COLKS)                                           ANAL0216
      COLKS=COLSTK                                                         ANAL0217
      TAXB=TAXB+DCOL                                                       ANAL0218
      IF (NJET.EQ.1) GO TO 140                                             ANAL0219
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      TAXL=TAXL+DCOL                                                    ANAL0220
  140 CONTINUE                                                          ANAL0221
      ANGR1=COLSTK*ANGR/100.                                            ANAL0222
      CALL VR3D (ANGR1,0.,0.,AYRJET,APRJET,ARRJET,TV1,TV2,TV3,1)       ANAL0223
      CALL XPRO (ARD,APD,AYD,TV1,TV2,TV3,RGR,PGR,YGR)                  ANAL0224
      ANGL1=COLSTK*ANGL/100.                                            ANAL0225
      CALL VR3D (ANGL1,0.,0.,-AYRJET,APRJET,ARRJET,TV1,TV2,TV3,1)      ANAL0226
      CALL XPRO (ARD,APD,AYD,TV1,TV2,TV3,RGL,PGL,YGL)                  ANAL0227
      CALL VR3D (TAXL,0.,0.,AYRJET,APRJET,ARRJET,XFRJET,YFRJET,ZFRJET,1)ANAL0228
      CALL XPRO (XAJET,YARJET,ZAJET,XFRJET,YFRJET,ZFRJET,LRJET,MRJET,  ANAL0229
     1    NRJET)                                                        ANAL0230
      CALL VR3D(TAXL,0.,0.,-AYRJET,APBJET,ARBJET,XFLJET,YFLJET,ZFLJET,1)ANAL0231
      CALL XPRO (XAJET,YALJET,ZAJET,XFLJET,YFLJET,ZFLJET,LLJET,MLJET,  ANAL0232
     1    NLJET)                                                        ANAL0233
      CALL LIFJET                                                       ANAL0234
      CALL REACT                                                        ANAL0235
      CALL JETINT                                                       ANAL0236
      RGYRO=RGYRO-RGR-RGL                                               ANAL0237
      PGYRO=PGYRO-PGR-PGL                                               ANAL0238
      YGYRO=YGYRO-YGR-YGL                                               ANAL0239
C     FORCE EQUATIONS                                                   ANAL0240
      XF=XFRWG+XFLWG+XFELE+XFFUS+XFRJET+XFLJET+XFGUN+XFFIN+XFW+XFRJ+XFLJANAL0241
     1     +XADD                                                        ANAL0242
      YF=                    YFFUS+YFRJET+YFLJET+YFGUN+YFFIN+YFW+YFRJ+YFLJANAL0243
     1     +YADD                                                        ANAL0244
      ZF=ZFRWG+ZFLWG+ZFELE+ZFFUS+ZFRJET+ZFLJET+ZFGUN       +ZFW+ZFRJ+ZFLJANAL0245
     1     +ZADD                                                        ANAL0246
C     MOMENT EQUATIONS                                                  ANAL0247
      QL=LRWG+LLWG+LELE+LFUS+LRJET+LLJET+LGUN+LFIN+RMRJ+RMLJ           ANAL0248
     1     +RGYRO+PMADD                                                 ANAL0249
      QM=MRWG+MLWG+MELE+MFUS+MRJET+MLJET+MGUN+MFIN+PMRJ+PMLJ           ANAL0250
     1     +PGYRO+PMADD                                                 ANAL0251
      QN=NRWG+NLWG+NELE+NFUS+NRJET+NLJET+NGUN+NFIN+YMRJ+YMLJ           ANAL0252
     1     +YGYRO+YMADD                                                 ANAL0253
      GFWD=(XFW-XF)*RW                                                  ANAL0254
      GLAT=(YFW-YF)*RW                                                  ANAL0255
      GVERT=(ZFW-ZF)*RW                                                 ANAL0256
  150 RETURN                                                            ANAL0257
      END                                                               ANAL0258

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      SUBROUTINE CLCD (ALP,CL,CD,XMAC,EXIT,N)                           CLCD0001
      COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLBO,CNBO,ETAQ,NJET, CLCD0002
     1                QFIN,CLRCL,YFS(14),CNBCL,CNPCL,CNRCD,CNRCL,COLKS, CLCD0003
     2                D3ELE,FNSWC,LWING,RPIST,YAERO(31,3),APRJET,ARRJET,CLCD0004
     3                AYBJET,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETAQMX, CLCD0005
     4                PWGWK1,RCWING,SWINGH,ANGR,ANGL,DFLAP              CLCD0006
      COMMON /STANRO/ DUM(2),LINK                                       CLCD0007
      COMMON /STRIAH/ TEMP(324),YWG(21)                                 CLCD0008
      DIMENSION HEAD(3)                                                 CLCD0009
      LOGICAL STALL                                                     CLCD0010
      DATA  DTRR,PI,TWOPI/ 57.29578,3.141593,6.283185/                  CLCD0011
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      DATA HALFPI/1.570796/                                              CLCD0012
      DATA HEAD/                                                         CLCD0013
     1     10H      WING ,10H ELEVATOR ,10H       FIN /                 CLCD0014
      STALL=.FALSE.                                                      CLCD0015
      ALF=ALP                                                            CLCD0016
   10 SG=1.                                                              CLCD0017
      IF(ALF.LT.0.) SG=-1.                                               CLCD0018
      AMG=SG*ALF                                                         CLCD0019
      IF(20.LE.AMG) GO TO 20                                             CLCD0020
      IF(PI.GE.AMG) GO TO 30                                             CLCD0021
      AMG=AMG-TWOPI                                                      CLCD0022
      ALF=AMG*SG                                                         CLCD0023
      GO TO 10                                                           CLCD0024
   20 WRITE (6,130) N                                                    CLCD0025
      EXIT=1.                                                            CLCD0026
      RETURN                                                             CLCD0027
   30 CONTINUE                                                           CLCD0028
   40 SMAC=1./SQRT(ABS(1.-XMAC**2))                                      CLCD0029
      ALI=0.                                                             CLCD0030
      CLA=YAERO(22,N)                                                    CLCD0031
      XK=YAERO(23,N)                                                     CLCD0032
      CDZ=YAERO(12,N)                                                    CLCD0033
      CD1 = YAERO(13,N)                                                  CLCD0034
      CD2 = YAERO(14,N)                                                  CLCD0035
      ALD=ALP*DTOR                                                       CLCD0036
      IF((HALFPI).GE.AMG) GO TO 50                                       CLCD0037
      AMG=PI-AMG                                                         CLCD0038
      SG=-SG                                                             CLCD0039
      AMX=YAERO(6,N)                                                     CLCD0040
      TAMX=TAN(AMX)                                                      CLCD0041
      CNAR=YAERO(26,N)                                                   CLCD0042
      CLZ=YAERO(7,N)                                                     CLCD0043
      GO TO 60                                                           CLCD0044
   50 CLZ=YAERO(3,N)                                                     CLCD0045
      AMX=YAERO(2,N)                                                     CLCD0046
      TAMX=TAN(AMX) $ CNAR=YAERO(24,N)                                   CLCD0047
   60 DCX=0.                                                             CLCD0048
      IF(N.EQ.1) DCX=YWG(20)*DFLAP*SG                                    CLCD0049
      IF(N.EQ.1) DCO=YWG(19)*DFLAP*SG                                    CLCD0050
      IF(AMG.GT.AMX) GOTO 70                                             CLCD0051
      TA=TAN(AMG)                                                        CLCD0052
      DCNA=XK*     (COS(TA/TAMX*PI/2.))**2.4                             CLCD0053
      CNA=CNAR+DCNA                                                      CLCD0054
      GOTO 80                                                            CLCD0055
   70 TA=TAN(AMG)                                                        CLCD0056
      X1=TAMX/TA                                                         CLCD0057
      D=-1.55*SIN((1.-.6*X1-.4*X1**2)*PI)                                CLCD0058
      CNA=CNAR+(1.16-CNAR)*(1.-X1)+D*CLA/2.3                             CLCD0059
   80 SA=SIN(AMG)                                                        CLCD0060
      CA=COS(AMG)                                                        CLCD0061
      S2A=SIN(2.*AMG)                                                    CLCD0062
      CL=CLA*S2A*CA/2.+CNA*SA**2*CA                                      CLCD0063
      IF(N.NE.1) GOTO 90                                                 CLCD0064
      DCL=0.                                                             CLCD0065
      IF(AMG.LE.AMX) DCL=DCO+(DCX-DCO)*AMG/AMX                           CLCD0066
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      IF(AMX.LT.AMG.AND.AMG.LE.(AMX+.0873))                              CLCD0067
     1    DCL=DCX*(1.-(AMG-AMX)/.0873)                                    CLCD0068
      CL=CL*DCL                                                          CLCD0069
   90 CONTINUE                                                           CLCD0070
      CL=CL*SG                                                           CLCD0071
      IF(AMG.GT.AMX) STALL=.TRUE.                                        CLCD0072
      CDZ=CDZ*SMAC                                                       CLCD0073
      IF(AMX.LT.AMG) GOTO 100                                            CLCD0074
      C6=AMG*CD2                                                         CLCD0075
      C7=CD1 + C6                                                        CLCD0076
      CD=CDZ+AMG*C7                                                      CLCD0077
      DCD=C6+C7                                                          CLCD0078
      GO TO 110                                                          CLCD0079
  100 CONTINUE                                                           CLCD0080
      CDX=CDZ+AMX*(CD1+AMX*CD2)                                          CLCD0081
      C5=AMG-HALFPI                                                      CLCD0082
      C6=C5*(CDX-1.2)/(AMX-HALFPI)**2                                    CLCD0083
      CD=C5*C6+1.2                                                       CLCD0084
      DCD=C6+C6                                                          CLCD0085
  110 CONTINUE                                                           CLCD0086
      E=.527*YAERO(1M,N)*(.1494-.01429*YAERO(18,N))                      CLCD0087
      ALI=    (CL/(PI*YAERO(18,N)*E))                                    CLCD0088
      IF(STALL.AND.LINK.NE.4) WRITE (6,120)  HEAD(N)          ,ALD,CL,CD CLCD0089
      C3=CD                                                              CLCD0090
      IF(N.EQ.1.AND.AMX.GE.AMG) C3=CD+YWG(11)*DFLAP                      CLCD0091
      IF(N.EQ.1.AND.AMX.LT.AMG.AND.AMG.LE.(AMX+.0873))                   CLCD0092
     1      C3=CD+YWG(11)*DFLAP*(1.-(AMG-AMX)/.0873)                    CLCD0093
      C4=CL                                                              CLCD0094
      NSGG = -1                                                          CLCD0095
      CALL VR2D (C3,C4,ALI,CD,CL,NSGG)                                   CLCD0096
      RETURN                                                             CLCD0097
  120 FORMAT (1H0,A10,*STALLED AT *,F7.3,* DEGREES CL = *,F6.3,* CD = *,CLCD0098
     1      F6.3)                                                       CLCD0099
  130 FORMAT (*0 EXCESSIVE ANGLE OF ATTACK FOR N = *,I2)                 CLCD0100
      END                                                                CLCD0101

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      SUBROUTINE COMSOL(COEF,REPRT1,ZPRT1,REPRT2,ZPRT2)                  COMS0001
C               SOLUTION OF SIMULTANEOUS EQUATIONS                       COMS0002
C               WITH COMPLEX COEFFICIENTS                                COMS0003
C               N = ORDER OF MATRIX                                      COMS0004
      DIMENSION COEF(2,3),A(2,5)                                         COMS0005
      COMPLEX A,TEMP,DET,COEF                                            COMS0006
      N=2                                                                COMS0007
      NP1 = 3                                                            COMS0008
      DO 10J = 1,NP1                                                     COMS0009
      DO 10I = 1,N                                                       COMS0010
      A(I,J) = COEF(I,J)                                                 COMS0011
   10 CONTINUE                                                           COMS0012
      DET = (1.0,0.0)                                                    COMS0013
C               COLUMNAR REARRANGEMENT OF MATRIX                         COMS0014
      NM1=N-1                                                            COMS0015
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      DO 60 I=1,NM1                                                    COMS0016
      JJ=I+1                                                           COMS0017
      IMAX=I                                                           COMS0018
C               N = ORDER OF MATRIX                                    COMS0019
      AMAXT = REAL(A(JJ,I))**2 + AIMAG(A(JJ,I))**2                     COMS0020
      DO 30J=JJ,N                                                      COMS0021
      ATEST1 = REAL(A(J,I))**2 + AIMAG(A(J,I))**2                      COMS0022
      ATEST2 = REAL(A(IMAX,I))**2 + AIMAG(A(IMAX,I))**2                COMS0023
      IF(ATEST1-ATEST2) 30,30,20                                       COMS0024
   20 IF(ATEST1.LE.AMAXT) GO TO 30                                     COMS0025
      AMAXT = ATEST1                                                   COMS0026
      IMAX = J                                                         COMS0027
   30 CONTINUE                                                         COMS0028
      IF(IMAX-I) 60,60,40                                              COMS0029
   40 DET=-DET                                                         COMS0030
      DO 50K=1,NP1                                                     COMS0031
      TEMP=A(I,K)                                                      COMS0032
      A(I,K)=A(IMAX,K)                                                 COMS0033
      A(IMAX,K)=TEMP                                                   COMS0034
   50 CONTINUE                                                         COMS0035
   60 CONTINUE                                                         COMS0036
C     AUGMENT INPUT MATRIX WITH THE IDENTITY MATRIX                    COMS0037
      NP2 = 4                                                          COMS0038
      N2P1 = 5                                                         COMS0039
      DO 80 I=1,N                                                      COMS0040
      DO 70 J =NP2,N2P1                                                COMS0041
      A(I,J) = 0.0                                                     COMS0042
   70 CONTINUE                                                         COMS0043
   80 CONTINUE                                                         COMS0044
      DO 90 I = 1,N                                                    COMS0045
      J = I + NP1                                                      COMS0046
      A(I,J) = 1.0                                                     COMS0047
   90 CONTINUE                                                         COMS0048
C     SOLUTION                                                         COMS0049
      DO 150 I=1,N                                                     COMS0050
      IP1 = I+1                                                        COMS0051
      TTEST = REAL(A(I,I))**2 + AIMAG(A(I,I))**2                       COMS0052
      IF(TTEST.LE.0.000001)  GO TO 170                                 COMS0053
  100 DO 110 J = IP1,N2P1                                              COMS0054
      A(I,J) = A(I,J)/A(I,I)                                           COMS0055
  110 CONTINUE                                                         COMS0056
      DO 140 K = 1,N                                                   COMS0057
      IF(K-I) 120,140,120                                              COMS0058
  120 DO 130 J = IP1,N2P1                                              COMS0059
      A(K,J) = A(K,J) - A(K,I)*A(I,J)                                  COMS0060
  130 CONTINUE                                                         COMS0061
  140 CONTINUE                                                         COMS0062
  150 CONTINUE                                                         COMS0063
C     DETERMINANT EVALUATION                                           COMS0064
      DO 160 I = 1,N                                                   COMS0065
      DET = DET * A(I,I)                                               COMS0066
  160 CONTINUE                                                         COMS0067
      REPRT1 = REAL(A(1,3))                                            COMS0068
      ZPRT1 = AIMAG(A(1,3))                                            COMS0069
      REPRT2 = REAL(A(2,3))                                            COMS0070
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      ZPRT2 = AIMAG(A(2,3))                                                 COMS0071
      RETURN                                                                COMS0072
C     SINGULAR MATRIX                                                       COMS0073
  170 PRINT 180,I,I,A(I,I)                                                  COMS0074
  180 FORMAT (/3H A(,I2,1H,,I2,4H) = ,2F10.8 )                              COMS0075
  190 FORMAT(7E12.4)                                                        COMS0076
      RETURN                                                                COMS0077
      END                                                                   COMS0078

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      SUBROUTINE CONTRL (NTRIM)                                             CONT0001
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)     CONT0002
      COMMON /RJETS/ NJ,XSTK(3)                                             CONT0003
      COMMON /MANAL/ ATEM(2),PED,BTEM(19),CYCR1,CYCR2                       CONT0004
      COMMON /STRIMA/ CTEM(170),ALGE1,ALGE2,DTEM(25),CYPWIC,RUDIND,         CONT0005
     1          ETEM(2),ALGE3                                               CONT0006
      COMMON /ROMAN/ FTEM(3),TIME                                           CONT0007
      COMMON /MANARO/ GTEM(3),DT,HTEM(16),CYSTK1                            CONT0008
C                                                                           CONT0009
C        XSYS(15) EQ 0 : CONVENTIONAL MECH. CONTROL USED                    CONT0010
C                                                                           CONT0011
      XLIM(X1,X2,X3)= AMAX1(X1,AMIN1(X2,X3))                               CONT0012
      XSTKF(X,X1,X2,X3)=(AMIN1(ABS(X),X3)*X1+AMAX1((ABS(X)-X3),0.)*X2)     CONT0013
     1     *SIGN(1.,X)                                                      CONT0014
      IF(XSYS(15).EQ.0.) GOTO 10                                            CONT0015
      IF (NTRIM .EQ. 2) GO TO 30                                            CONT0016
      IF (NTRIM .EQ. 1) GO TO 20                                            CONT0017
   10 XA=0.                                                                 CONT0018
C  NTRIM=0 -- INITIALIZATION HERE                                           CONT0019
      X0=0.                                                                 CONT0020
      NTRIM=1                                                               CONT0021
   20 DX1=ALGE3*57.3                                                        CONT0022
C  NTRIM=1 -- TRIM CONTROL LAWS ARE INSERTED HERE                           CONT0023
      XA=XSTKF(XSTK(1),ALGE1,ALGE2,DX1)+X0                                  CONT0024
      IF(XSYS(15).EQ.0.) GOTO 40                                            CONT0025
   30 CONTINUE                                                              CONT0026
C  NTRIM=2 -- TIME HISTORY CONTROL LAWS ARE INSERTED HERE                   CONT0027
   40 DELTA(1) = XA                                                         CONT0028
   50 DELTA(2) = CYPWIC*CYCR2                                               CONT0029
      DELTA(3) = RUDIND*PED                                                 CONT0030
      DELTA(4) = 0.                                                         CONT0031
      DELTA(1)=DELTA(1)/57.3                                                CONT0032
      RETURN                                                                CONT0033
   60 FORMAT (1H0,5X,2E15.5)                                                CONT0034
      END                                                                   CONT0035

*****************************************************************************

      SUBROUTINE CONV (IMET)                                                CONV0001
      COMMON /STRIAB/ T1(184),XEL(14),XER(7),XFC(28),XFN(7),XFS(35),        CONV0002
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     1                 XGN(7),XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),    CONV0003
     2                 T2(27),XCON(63),XJET(14),T3(52),XRJT(140),YRJT(7),CONV0004
     3                 XLJT(84),YLJT(7)                                   CONV0005
      COMMON /STRIMA/ T4(140),TSTAB(14)                                   CONV0006
      COMMON /CONTR/  T5(15),XSYS(28)                                     CONV0007
      COMMON /MET1/   XR(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21),    CONV0008
     1                XJ(14),XC(63),YR(7),XR(140),XT(28),XD(7),XI(21),    CONV0009
     2                YL(7),XL(84),XS(28),TS(14),XCM(20,6)                CONV0010
      DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.393701,.737562,10.76391,   CONV0011
     1     35.31466,.571015,.737562,.050539,3.28084/                      CONV0012
      DO 10 I=1,7                                                         CONV0013
      XER(I)=XD(I)                                                        CONV0014
      YRJT(I)=YR(I)                                                       CONV0015
      YLJT(I)=YL(I)                                                       CONV0016
      XFN(I)=XF(I)                                                        CONV0017
   10 XGN(I)=0.                                                           CONV0018
      DO 20 I=1,14                                                        CONV0019
      TSTAB(I)=TS(I)                                                      CONV0020
      XEL(I)=XE(I)                                                        CONV0021
   20 XJET(I)=XJ(I)                                                       CONV0022
      DO 30 I=1,21                                                        CONV0023
      XIT(I)=XI(I)                                                        CONV0024
      XWG(I)=XW(I)                                                        CONV0025
      YWG(I)=YW(I)                                                        CONV0026
      YEL(I)=YE(I)                                                        CONV0027
   30 YFN(I)=YF(I)                                                        CONV0028
      DO 40 I=1,28                                                        CONV0029
      XFC(I)=XT(I)                                                        CONV0030
   40 XSYS(I)=XS(I)                                                       CONV0031
      DO 50 I=1,35                                                        CONV0032
   50 XFS(I)=XR(I)                                                        CONV0033
      DO 60 I=1,63                                                        CONV0034
   60 XCON(I)=XC(I)                                                       CONV0035
      DO 70 I=1,84                                                        CONV0036
   70 XLJT(I)=XL(I)                                                       CONV0037
      DO 80 I=1,140                                                       CONV0038
   80 XRJT(I)=XR(I)                                                       CONV0039
      IF(IMET.NE.0) RETURN                                                CONV0040
      NR=YR(1)                                                            CONV0041
      NL=YL(1)                                                            CONV0042
      XFS(1)=XR(1)*F1                                                     CONV0043
      XFS(35)=XR(35)*F1                                                   CONV0044
      DO 90 I=1,3                                                         CONV0045
   90 XER(I)=XD(I)*F1                                                     CONV0046
      YRJT(3)=YR(3)/F1                                                    CONV0047
      YRJT(4)=YR(4)/F1                                                    CONV0048
      DO 100 I=2,7                                                        CONV0049
      XCON(I+54)=XC(I+54)*F9                                              CONV0050
  100 XFS(I)=XR(I)*F2                                                     CONV0051
      XFS(33)=XR(33)*F2                                                   CONV0052
      XFS(34)=XR(34)*F2                                                   CONV0053
      DO 110 I=2,4                                                        CONV0054
      XWG(I)=XW(I)*F2                                                     CONV0055
      XEL(I)=XE(I)*F2                                                     CONV0056
      XFN(I)=XF(I)*F2                                                     CONV0057
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      XJET(I+2)=XJ(I+2)*F2                                          CONV0058
  110 XFC(I+21)=XT(I+21)*F9                                         CONV0059
      XCON(2)=XC(1)*F2                                              CONV0060
      DO 120 I=1,2                                                  CONV0061
      XCON(I+2)=XC(I+2)*F2                                          CONV0062
      XCON(I+5)=XC(I+5)/F2                                          CONV0063
      XCON(I+7)=XC(I+7)*F2                                          CONV0064
      XCON(I+10)=XC(I+10)/F2                                        CONV0065
      XCON(I+24)=XC(I+24)*F2                                        CONV0066
      XCON(I+26)=XC(I+26)/F2                                        CONV0067
      XCON(I+28)=XC(I+28)*F2                                        CONV0068
      XIT(I+11)=XI(I+11)*F2                                         CONV0069
      XFS(2*I+14)=XB(2*I+14)*F4                                     CONV0070
      XFS(10*I+11)=XB(10*I+11)*F4                                   CONV0071
      XFS(2*I+22)=XB(2*I+22)*F5                                     CONV0072
      XCON(3*I-1)=XC(3*I-1)*F6                                      CONV0073
      XER(I+3)=XD(I+3)*F7                                           CONV0074
  120 XFC(I+2)=XT(I+2)*F9                                           CONV0075
      XCON(31)=XC(31)/F2                                            CONV0076
      XCON(32)=XC(32)*F2                                            CONV0077
      DO 130 I=36,46,2                                              CONV0078
  130 XCON(I)=XC(I)*F2                                              CONV0079
      DO 140 I=8,11                                                 CONV0080
  140 XFS(I)=XB(I)*F3                                               CONV0081
      XJET(10)=XJ(10)*F3                                            CONV0082
      XWG(1)=XW(1)*F4                                               CONV0083
      YWG(4)=YW(4)*F4                                               CONV0084
      XEL(1)=XE(1)*F4                                               CONV0085
      YEL(4)=YE(4)*F4                                               CONV0086
      XFN(1)=XF(1)*F4                                               CONV0087
      YFN(4)=YF(4)*F4                                               CONV0088
      XFS(29)=XB(29)*F5                                             CONV0089
      XCON(10)=XC(10)*F6                                            CONV0090
      XIT(14)=XI(14)*F7                                             CONV0091
      YWG(10)=YW(10)*F9                                             CONV0092
      YEL(10)=YF(10)*F9                                             CONV0093
      YFN(10)=YF(10)*F9                                             CONV0094
      XFC(14)=XT(14)*F9                                             CONV0095
      XFC(27)=XT(27)*F9                                             CONV0096
      XIT(4)=XI(4)*F9                                               CONV0097
      DO 160 N=1,NR                                                 CONV0098
      XRJT(14*(N-1)+10)=XR(14*(N-1)+10)*F1                          CONV0099
      XRJT(14*(N-1)+11)=XR(14*(N-1)+11)*F1                          CONV0100
      DO 150 I=1,3                                                  CONV0101
      XRJT(14*(N-1)+I)=XR(14*(N-1)+I)*F2                            CONV0102
  150 XRJT(14*(N-1)+6+I)=XR(14*(N-1)+6+I)*F2                        CONV0103
  160 CONTINUE                                                      CONV0104
      DO 180 N=1,NL                                                 CONV0105
      XLJT(14*(N-1)+ 8)=XL(14*(N-1)+ 8)*F3                          CONV0106
      XLJT(14*(N-1)+12)=XL(14*(N-1)+12)/F1                          CONV0107
      XLJT(14*(N-1)+13)=XL(14*(N-1)+13)/F8                          CONV0108
      DO 170 I=1,3                                                  CONV0109
  170 XLJT(14*(N-1)+I)=XL(14*(N-1)+I)*F2                            CONV0110
  180 CONTINUE                                                      CONV0111
      RETURN                                                        CONV0112
```

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      END                                                                CONV0113

*********************************************************************************

      SUBROUTINE CONV1 (J,X,I)                                           CNV10001
      COMMON /MFT1/ T1(553),Y(20,6)                                      CNV10001
      DIMENSION X(20,6)                                                  CNV10002
      DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.393701,.737562,10.76391,  CNV10003
     1     35.31466,.571015,.737562,.050539,3.28084/                     CNV10004
      DO 1 I1=1,6                                                        CNV10004
    1 X(I,I1)=Y(I,I1)                                                    CNV10004
      IF(J.GT.20) RETURN                                                 CNV10005
      GO TO (10,10,10,10,10,10,10,10,20,20,20,20,80,40,80,80,50,60,60,   CNV10006
     1       70),J                                                       CNV10007
   10 X(I,2)=Y(I,2)*F2                                                   CNV10008
      X(I,5)=Y(I,5)*F2                                                   CNV10009
      RETURN                                                             CNV10010
   20 DO 30 K=1,6                                                        CNV10011
   30 X(I,K)=Y(I,K)*F9                                                   CNV10012
   40 X(I,3)=Y(I,3)*F1                                                   CNV10013
      X(I,5)=Y(I,5)*F1                                                   CNV10014
      RETURN                                                             CNV10015
   50 X(I,2)=Y(I,2)*F2                                                   CNV10016
      RETURN                                                             CNV10017
   60 X(I,2)=Y(I,2)*F2                                                   CNV10018
      X(I,3)=Y(I,3)*F2                                                   CNV10019
      RETURN                                                             CNV10020
   70 X(I,3)=Y(I,3)*F2                                                   CNV10021
   80 RETURN                                                             CNV10022
      END                                                                CNV10023

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      SUBROUTINE CON1 (XCON,COLJET)                                      CON10001
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,     CON10002
     1                COLL(6),CYCF(3),CYCL(3),DIST,XCIT(20),PEDA(3),     CON10003
     2                TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,      CON10004
     3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,         CON10005
     4                TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,        CON10006
     5                ZDELT1,ZDELT2                                      CON10007
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,       CON10008
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,   CON10009
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,   CON10010
     3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,   CON10011
     4                YAELF,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,       CON10012
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1          CON10013
      DIMENSION xCON(63)                                                 CON10014
      DATA DTR,PIOTR/ .1745329E-01,.1745329E-03/                         CON10015
C     SET UP VALUES FOR MAIN THROTTLE                                    CON10016
      COLL(1)=XCON(1)                                                    CON10017
      IF(COLL(1).EQ.0.) COLL(1)=100.                                     CON10018
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      RANGE=COLL(1)*P01DTR                                                    CON10019
      COLJET=XCON(2)*COLL(1)/100.                                             CON10020
C     SET UP VALUES FOR LONG STICK                                            CON10021
      CYCF(1)=XCON(25)                                                        CON10022
      IF(CYCF(1).EQ.0.) CYCF(1)=100.                                          CON10023
      CYCF(2)=-.5*XCON(25)*DTR                                                CON10024
      IF(CYCF(2).EQ.0.) CYCF(2)=-.8726646                                     CON10025
      CYCF(3)=XCON(25)*P01DTR                                                 CON10026
      IF(CYCF(3).EQ.0.) CYCF(3)=DTR                                           CON10027
      ALGE1=XCON(27)                                                          CON10028
      ALGE2=XCON(28)                                                          CON10029
C     SET UP VALUES FOR LAT STICK                                             CON10030
      CYCL(1)=XCON(29)                                                        CON10031
      IF(CYCL(1).EQ.0.) CYCL(1)=100.                                          CON10032
      CYCL(2)=XCON(30)*DTR                                                    CON10033
      IF(CYCL(2).EQ.0.) CYCL(2)=-.8726646                                     CON10034
      CYCL(3)=XCON(29)*P01DTR                                                 CON10035
      IF(CYCL(3).EQ.0.) CYCL(3)=DTR                                           CON10036
      CYPWIC=XCON(31)                                                         CON10037
C     SET UP VALUES FOR PEDAL                                                 CON10038
      PEDA(1)=XCON(32)                                                        CON10039
      IF(PEDA(1).EQ.0.) PEDA(1)=100.                                          CON10040
      PEDA(2)=XCON(33)*DTR                                                    CON10041
      IF(PEDA(2).EQ.0.) PEDA(2)=-.8726646                                     CON10042
      PEDA(3)=XCON(34)*P01DTR                                                 CON10043
      IF(PEDA(3).EQ.0.) PEDA(3)=DTR                                           CON10044
      RUDIND=1.                                                               CON10045
      RETURN                                                                  CON10046
      END                                                                     CON10047

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      SUBROUTINE CPLOT(NPLOT)                                                 CPL00001
      COMMON /TOPLOT/ ADUM(28),NPART,NVARA,NVARB,NVARC,NSCALE,NVARS,          CPL00002
     1                NPRINT,NTIME                                            CPL00003
      COMMON /PLOTD/ HEAD(2,210)                                              CPL00004
      INTEGER HEAD                                                            CPL00005
      DIMENSION A(209)                                                        CPL00006
      DIMENSION X(200),Y1(200),Y2(200),Y3(200)                                CPL00007
      DIMENSION LABY(2),LABX(2),LABTL(14),NPTS(2),LABVAL(2),VLABL(2)          CPL00008
      DATA LABX /10HTIME, SEC0,3HNDS/                                         CPL00009
      READ 10, LABTL                                                          CPL00010
   10 FORMAT(8A10/6A10)                                                       CPL00011
      FAC=NSCALE/100.                                                         CPL00012
      NPTS(2)=0                                                               CPL00013
      NPT=0                                                                   CPL00014
   20 READ(3) IP,T,A                                                          CPL00015
      IF(T.GT.1000.) GOTO 30                                                  CPL00016
      NTIME=NTIME+1                                                           CPL00017
      IF(NTIME.EQ.NPRINT) NTIME=0                                             CPL00018
      IF(NTIME.NE.0) GOTO 20                                                  CPL00019
      NPT=NPT+1                                                               CPL00020
      X(NPT)=T                                                                CPL00021
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      Y1(NPT)=A(NVARA)                                                    CPL00022
      Y2(NPT)=A(NVARB)                                                    CPL00023
      Y3(NPT)=A(NVARC)                                                    CPL00024
      IF(NPT.GE.200) GOTO 30 $ GOTO 20                                    CPL00025
   30 IF(NVARA.EQ.0) GOTO 70                                              CPL00026
      NPTS(1)=NPT                                                         CPL00027
      DO 40 I=1,2                                                         CPL00028
   40 LABY(I)=HEAD(I,NVARA)                                               CPL00029
      CALL GPPR    (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y1,NPTS,LABVAL,0,      CPL00030
     1              VLABL,0,3,1,FAC)                                      CPL00031
      IF(NVARB.EQ.0) GOTO 70                                              CPL00032
      DO 50 I=1,2                                                         CPL00033
   50 LABY(I)=HEAD(I,NVARB)                                               CPL00034
      CALL GPPR    (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y2,NPTS,LABVAL,0,      CPL00035
     1              VLABL,0,3,1,FAC)                                      CPL00036
      IF(NVARC.EQ.0) GOTO 70                                              CPL00037
      DO 60 I=1,2                                                         CPL00038
   60 LABY(I)=HEAD(I,NVARC)                                               CPL00039
      CALL GPPR    (NPLOT,LABY,2,LABX,2,LABTL,14,X,Y3,NPTS,LABVAL,0,      CPL00040
     1              VLABL,0,3,1,FAC)                                      CPL00041
   70 RETURN                                                              CPL00042
      END                                                                 CPL00043
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      SUBROUTINE CURVET                                                   CURV0001
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                     CURV0002
     1                NPART,NVARA,NVARB,NVARC,NSCALE                       CURV0003
     1                ,NVARS,NPRINT,NTIME                                  CURV0004
      COMMON /PLOTD/ HEAD(2,210)                                          CURV0005
      DIMENSION A(209),NC(209),AMP(209),PHI(209),C(209),SUM1(209),        CURV0006
     1          SUM2(209),SUM3(209),SUM4(209),COEF(209),NUMC(209)        CURV0007
      CALL TIMEX (TUSED,TDELT,TLEFT)                                      CURV0008
      DTR=.174532925E-01                                                  CURV0009
      DTRR=57.2957795                                                     CURV0010
      TWOPI=6.283185307                                                   CURV0011
C         INITIALIZE VARIABLE SUMS                                        CURV0012
      DO 10 I=1,209                                                       CURV0013
      NC(I)=0                                                             CURV0014
      SUM1(I)=0.                                                          CURV0015
      SUM2(I)=0.                                                          CURV0016
      SUM3(I)=0.                                                          CURV0017
      SUM4(I)=0.                                                          CURV0018
   10 CONTINUE                                                            CURV0019
C         READ CODES FOR VARIABLES TO BE FIT                              CURV0020
      READ (5,140) (NC(I),I=1,NVARA)                                      CURV0021
C         SKIP TRANSIENT POINTS                                           CURV0022
      DO 20 I=1,NVARC                                                     CURV0023
      READ (3) JPSN,T,A                                                   CURV0024
   20 CONTINUE                                                            CURV0025
C         CHANGE INPUT CPS TO RAD/SEC AND INITIALIZE TIME SUMS            CURV0026
      OMEGA=AL(1)*TWOPI                                                   CURV0027
      S1=0.                                                               CURV0028
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      S2=0.                                                              CURV0029
      S3=0.                                                              CURV0030
      S4=0.                                                              CURV0031
      S5=0.                                                              CURV0032
      KOUNT=0                                                            CURV0033
   30 READ (3)          JPSN,T,A                                         CURV0034
      IF(EOF(3))60,40                                                    CURV0035
   40 CONTINUE                                                           CURV0036
      IF(KOUNT.EQ.0) TSTART=T                                            CURV0037
      IF(T.GT.9.E+07) GO TO 60                                           CURV0038
      OT=OMEGA*T                                                         CURV0039
      X=SIN(OT)                                                          CURV0040
      Y=COS(OT)                                                          CURV0041
C          COMPUTE SUMS WHICH ARE CONSTANT WRT VARIABLES AND COUNT POINTSCURV0042
      S1=S1+X                                                            CURV0043
      S2=S2+Y                                                            CURV0044
      S3=S3+X*X                                                          CURV0045
      S4=S4+Y*Y                                                          CURV0046
      S5=S5+X*Y                                                          CURV0047
      KOUNT=KOUNT+1                                                      CURV0048
C          COMPUTE SUMS DEPENDENT UPON EACH VARIABLE                     CURV0049
      DO 50 J=1,NVARA                                                    CURV0050
      I=NC(J)                                                            CURV0051
      B=A(I)                                                             CURV0052
      SUM1(I)=SUM1(I)+B                                                  CURV0053
      SUM2(I)=SUM2(I)+B*X                                                CURV0054
      SUM3(I)=SUM3(I)+B*Y                                                CURV0055
      SUM4(I)=SUM4(I)+B*B                                                CURV0056
   50 CONTINUE                                                           CURV0057
      GO TO 30                                                           CURV0058
C          COMPUTE INTERMEDIATE VARIABLES                                CURV0059
   60 DIFF1=KOUNT*S3-S1**2                                               CURV0060
      DIFF2=KOUNT*S4-S2**2                                               CURV0061
      DIFF3=KOUNT*S5-S1*S2                                               CURV0062
      DENOM=DIFF1*DIFF2-DIFF3**2                                         CURV0063
      CALL WROT                                                          CURV0064
      WRITE (6,150) TSTART,AL(1)                                         CURV0065
C          COMPUTE AMPLITUDE, PHASE ANGLE, CONSTANT, AND RESIDUE         CURV0066
      DO 70 J=1,NVARA                                                    CURV0067
      I=NC(J)                                                            CURV0068
      DIFF5=KOUNT*SUM2(I)-S1*SUM1(I)                                     CURV0069
      DIFF6=KOUNT*SUM3(I)-S2*SUM1(I)                                     CURV0070
      CON1=(DIFF5*DIFF2-DIFF6*DIFF3)/DENOM                               CURV0071
      CON2=(DIFF1*DIFF6-DIFF5*DIFF3)/DENOM                               CURV0072
      AMP(I)= SQRT(CON1**2+CON2**2)                                      CURV0073
      PHI(I)= ATAN2(CON2,CON1)*DTRR                                      CURV0074
      CON3=(SUM1(I)-CON1*S1-CON2*S2)/KOUNT                               CURV0075
      DIFF7    =CON1*(CON1*S3-2.*SUM2(I)+2.*CON2*S5+2.*CON3*S1)          CURV0076
     1         +CON2*(CON2*S4-2.*SUM3(I)+2.*CON3*S2)                     CURV0077
     2         +CON3*(KOUNT*CON3-2.*SUM1(I))+SUM4(I)                     CURV0078
      C(I)=CON3                                                          CURV0079
      COEF(I)= SQRT(1.-DIFF7/(SUM4(I)-SUM1(I)**2/KOUNT))                 CURV0080
      WRITE(6,160) (HEAD(K,I),K=1,2),AMP(I),PHI(I),C(I),COEF(I)          CURV0081
   70 CONTINUE                                                           CURV0082
      IF(NVARB.EQ.0) GO TO 100                                           CURV0083
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      CALL #ROT                                                          CURV0084
      #RITE (6,170)                                                      CURV0085
C          AMPLITUDE AND PHASE ANGLE COMPARISONS                         CURV0086
      DO 90 I=1,NVARB                                                    CURV0087
      READ (5,140) NNUM,ND,(NUMC(J),J=1,NNUM)                            CURV0088
      Q1=1./AMP(ND)                                                      CURV0089
      Q2=PHI(ND)                                                         CURV0090
      DO 80 K=1,NNUM                                                     CURV0091
      J=NUMC(K)                                                          CURV0092
      RATIO=AMP(J)*Q1                                                    CURV0093
      DIFF=PHI(J)-Q2                                                     CURV0094
      #RITE(6,180) (HEAD(L,J),L=1,2),(HEAD(L,ND),L=1,2),RATIO,DIFF       CURV0095
   80 CONTINUE                                                           CURV0096
   90 CONTINUE                                                           CURV0097
  100 KLIN=AL(2)+.1                                                      CURV0098
      IF(KLIN.EQ.0) GO TO 130                                            CURV0099
      CALL #ROT                                                          CURV0100
      #RITE (6,220)                                                      CURV0101
      DO 120 J=1,KLIN                                                    CURV0102
      READ (5,140) NDEP,NIN1,NIN2                                        CURV0103
      SIN2=SIN((PHI(NIN1)-PHI(NIN2))*DTR)                                CURV0104
      IF(ABS(SIN2).LT..0001) GO TO 110                                   CURV0105
      SIN1=SIN((PHI(NIN1)-PHI(NDEP))*DTR)                                CURV0106
      SIN3=SIN((PHI(NDEP)-PHI(NIN2))*DTR)                                CURV0107
      XK1=AMP(NDEP)/SIN2                                                 CURV0108
      XK2=XK1*SIN3                                                       CURV0109
      XK3=XK1*SIN1                                                       CURV0110
      BK=XK2/AMP(NIN1)                                                   CURV0111
      CK=XK3/AMP(NIN2)                                                   CURV0112
      DK=C(NDEP)-BK*C(NIN1)-CK*C(NIN2)                                   CURV0113
      #RITE(6,200) (HEAD(K,NDEP),K=1,2),(HEAD(K,NIN1),K=1,2),BK,         CURV0114
     1           (HEAD(K,NIN2),K=1,2),CK,DK                             CURV0115
      GO TO 120                                                          CURV0116
  110 #RITE(6,210) (HEAD(K,NIN1),K=1,2),(HEAD(K,NIN2),K=1,2)             CURV0117
  120 CONTINUE                                                           CURV0118
  130 CALL TIMEX (TUSED,TDELT,TLEFT)                                     CURV0119
      #RITE (6,190) TDELT,TUSED                                          CURV0120
      RETURN                                                             CURV0121
  140 FORMAT (14I5)                                                      CURV0122
  150 FORMAT(1H0//1H ,32X,38HLEAST SQUARES CURVE FIT STARTING AFTER,     CURV0123
     1    F7.3,22H SECONDS MANEUVER TIME,//1H ,23X,                     CURV0124
     1      54HF(T) = AMPLITUDE*SIN(OMEGA*T + PHASE ANGLE) + CONSTANT   CURV0125
     2    10X,12HWITH OMEGA =,F6.3,4H CPS//1H ,14X,                     CURV0126
     3    8HVARIABLE,17X,9HAMPLITUDE,6X,21HPHASE ANGLE (DEGREES),7X,    CURV0127
     4    8HCONSTANT,11X,12HCOEF. OF CORR)                              CURV0128
  160 FORMAT(1H0,6X,2A10,4(6X,G15.5))                                    CURV0129
  170 FORMAT(1H0//1H ,46X,37HAMPLITUDE AND PHASE ANGLE COMPARISONS//     CURV0130
     1    1H ,27X,9HVARIABLES,27X,15HAMPLITUDE RATIO,3X,                CURV0131
     2      23HPHASE ANGLE DIFFERENCE )                                 CURV0132
  180 FORMAT(1H0,7X,2A10,1H/,2A10,2(7X,G15.5))                           CURV0133
  190 FORMAT(1H0,10X,F10.3,31H  MINUTES USED IN CURVE FITTING,           CURV0134
     1   F10.3,30H  MINUTES TOTAL COMPUTING TIME )                       CURV0135
  200 FORMAT(1H0,30X,1HA,10X,2A10/                                       CURV0136
     1         1H ,30X,1HB,10X,2A10,10X,G15.5/                           CURV0137
     2         1H ,30X,1HC,10X,2A10,10X,G15.5/                           CURV0138
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     3        1H ,69X,8HCONSTANT ,10X,G15.5)                                    CURV0139
 210 FORMAT(1H0,10X,35HTHE PHASE ANGLE DIFFERENCE BETWEEN ,2A10,               CURV0140
     1    5H AND ,2A10/1H ,10X, 99HIS A MULTIPLE OF 180 DEGREES. THEREFOCURV0141
     2RE, NO VARIABLE CAN BE EXPRESSED AS A LINEAR FUNCTION OF THEM.)          CURV0142
 220 FORMAT(1H0//1H ,35X, 62HVARIABLE 'A' AS A LINEAR COMBINATION OF VACURV0143
     1RIABLES 'B' AND 'C'.//1H ,56X,21H A = KB*B + KC*C + KD//1H ,             CURV0144
     2    27X,8HVARIABLE,16X,4HNAME,24X,11HCOEFFICIENT/)                       CURV0145
      END                                                                      CURV0146

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      SUBROUTINE DAMPER                                                        DAMP0001
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,              DAMP0002
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RHO,R12,SPD(6,6,1),           DAMP0003
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),            DAMP0004
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),ELCG,            DAMP0005
     4                DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),          DAMP0006
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),        DAMP0007
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)DAMP0008
     7               ,XLJT(84),YLJT(7)                                         DAMP0009
      XLIMIT=.5*XLIMIT                                                         DAMP0010
      &F(XLIMIT.LT.XMIN) XLIMIT=XMIN                                           DAMP0011
      EPD=.5*XLIMIT                                                            DAMP0012
      IF(EPD.LT..1745329E-03) EPD=.1745329E-03                                 DAMP0013
      DO 10 I=1,11                                                             DAMP0014
      DEPD(I)=EPD*EPDX(I)                                                      DAMP0015
   10 CONTINUE                                                                 DAMP0016
      RETURN                                                                   DAMP0017
      END                                                                      DAMP0018

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      BLOCK DATA                                                               DATA0001
      COMMON /PLOTD/ PLOT2(2,10),PLOT3(2,10),PLOT4(2,10),PLOT5(2,10),          DATA0002
     U               PLOT10(2,20),PLOT1(2,10),PLOTA(2,10),PLOTB(2,10),         DATA0003
     1               PLOTC(2,10),PLOTD(2,10),PLOTE(2,10),PLOTF(2,10),          DATA0004
     2               PLOTG(2,10),PLOTH(2,10),PLOTI(2,10),PLOTJ(2,10),          DATA0005
     3               PLOTK(2,10),PLOTL(2,10),PLOTM(2,10),PLOTN(2,10)           DATA0006
      DATA PLOT10/ 40*10H          /                                           DATA0007
      DATA PLOT2 / 10HLIFT THRUS,8HT 1, N  ,10HLIFT THRUS,8HT 2, N  ,          DATA0008
     1 10HLIFT THRUS,8HT 3, N  ,10HLIFT THRUS,8HT 4, N  ,10HLIFT THRUS,       DATA0009
     2 8HT 5, N  ,10HLIFT THRUS,8HT 6, N  ,10HLIFT ANGLE,7H 1, DEG,           DATA0010
     3 10HLIFT ANGLE,7H 2, DEG,10HLIFT ANGLE,7H 3, DEG,10HLIFT ANGLE,         DATA0011
     4 7H 4, DEG/                                                             DATA0012
      DATA PLOT3 / 10HLIFT ANGLE,7H 5, DEG,10HLIFT ANGLE,7H 6, DEG,           DATA0013
     1 10HREACT THRU,9HST 1, N  ,10HREACT THRU,9HST 2, N  ,10HREACT THRUDATA0014
     2,9HST 3, N  ,10HREACT THRU,9HST 4, N  ,10HREACT THRU,9HST 5, N  ,       DATA0015
     3 10HREACT THRU,9HST 6, N  ,10HREACT THRU,9HST 7, N  ,10HREACT THRUDATA0016
     4,9HST 8, N  /                                                           DATA0017
      DATA PLOT4 / 10HREACT THRU,9HST 9, N  ,10HREACT THRU,10HST 10, N         DATA0018
     1,10HLONG STICK,4H, CM,10HSTAB DEFL,,4H DEG,10HLAT STICK,,3H CM,         DATA0019
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2 10HAILERON DE,7HFL, DEG,10HFWD RCS TH,9HRUST, PCT,10HFWD RCS AN, DATA0020
3 8HGLE, DEG,10HSPOILER DE,7HFL, DEG,10HAFT RCS TH,9HRUST, PCT/    DATA0021
 DATA PLOTS / 10HAFT RCS AN,8HGLE, DEG,9HRUD PEDAL,8HDEFL, CM,     DATA0022
1 10HRUDDER DEF,6HL, DEG,10HLAT RCS TH,9HRUST, PCT,12*1H /         DATA0023
 DATA PLOT1 / 18*1H ,10HFLAP DEFL,,4H DEG/                         DATA0024
 DATA PLOTA / 10HX-DOT, MPS,1H ,10HY-DOT, MPS,1H ,10HZ-DOT, MPS,   DATA0025
1 1H ,10HHORIZONTAL,5H DIST, M ,9HAIRSPEED,,3HKTS, 10HHEADING AN, DATA0026
2 8HGLE, DEG,5HX, M ,1H ,5HY, M ,1H ,5HZ, M ,1H ,9HALTITUDE,,2HM / DATA0027
 DATA PLOTB / 10HGROUND SPE,7HED, KTS,10HFLT PATH A,9HNGLE, DEG,   DATA0028
1 10HU-DOT, MPS,1HS,10HV-DOT, MPS,1HS,10HW-DOT, MPS,1HS,           DATA0029
2 10HP-DOT, DPS,1HS,10HQ-DOT, DPS,1HS,10HR-DOT, DPS,1HS,2*1H ,     DATA0030
3 6HU, MPS,1H /                                                    DATA0031
 DATA PLOTC / 6HV, MPS,1H ,6HW, MPS,1H ,6HP, DPS,1H ,6HQ, DPS,1H , DATA0032
1 6HR, DPS,1H ,2*1H ,10HPSI-DOT, D,2HPS,10HTHETA-DOT,,4H DPS,      DATA0033
2 10HPHI-DOT, D,2HPS,2HPSI, DEG,1H /                               DATA0034
 DATA PLOTD / 10HTHETA, DEG,1H ,6HPHI, DEG,1H ,10HFIX ENG TH,      DATA0035
1 8HROT, PCT,10HLONG STICK,5H, PCT,10HALPHA (L W,9HING), DEG,      DATA0036
2 10HALPHA (R W,9HING), DEG,10HALPHA (STA,7HB), DEG,10HALPHA (FIN, DATA0037
3 6H), DEG,9HYAW ALPHA,10H(FUS), DEG,9HFS CG, CM,1H /              DATA0038
 DATA PLOTF / 9HU (GUST),,3HMPS,8HN-X, G'S,1H ,10HLAT STICK,,4H PCTDATA0039
1,10HCL (L WING,1H),10HCL (R WING,1H),9HCL (STAB),1H ,8HCL (FIN), DATA0040
2 1H ,10HALPHA (FUS,6H), DEG,9HBL CG, CM,1H ,9HV (GUST),,3HMPS/    DATA0041
 DATA PLOTF /8HN-Y, G'S,1H ,10HRUD PEDAL,,4H PCT,10HCD (L WING,    DATA0042
1 1H),10HCD (R WING,1H),9HCD (STAB),1H ,8HCD (FIN),1H ,9HWL CG, CM,DATA0043
2 1H ,9HW (GUST),, 3HMPS,8HN-Z, G'S,1H ,10HLIFT THROT,7H 1, PCT/   DATA0044
 DATA PLOTG / 10HLIFT THROT,7H 2, PCT,10HANGLE LEVE,8HR 1, PCT,    DATA0045
1 10HRT JET THR,8HUST, N ,10HANGLE LEVE,8HR 2, PCT,10HLEFT JET T, DATA0046
2 10HHRUST, N ,9HFX-TOTAL,,3HN ,10HFX-RT WING,5H, N ,              DATA0047
3 10HFX-L WING,,4H N ,10HFX-STAB, N,2H ,10HFX-FUS, N ,1H /         DATA0048
 DATA PLOTH / 10HFX-RT JET,,4H N ,10HFX-LEFT JE,6HT, N ,           DATA0049
1 10HFX-REACT J,8HETS, N ,10HFX-LIFT JE,7HTS, N ,10HFX-INLET, ,    DATA0050
2 1HN,10HFX-FIN, N ,1H ,10HFX-WEIGHT,,4H N ,10HFX-INTERFE,         DATA0051
3 10HRENCE, N ,9HFY-TOTAL,,3HN ,10HFY-FUS, N ,1H /                 DATA0052
 DATA PLOTI / 10HFY-RT JET,,4H N ,10HFY-LEFT JE,6HT, N ,           DATA0053
1 10HFY-REACT J,8HETS, N ,10HFY-LIFT JE,7HTS, N ,10HFY-INLET, ,    DATA0054
2 1HN,10HFY-FIN, N ,1H ,10HFY-WEIGHT,,4H N ,10HFY-INTERFE,         DATA0055
3 10HRENCE, N ,9HFZ-TOTAL,,3HN ,10HFZ-RT WING,5H, N /              DATA0056
 DATA PLOTJ / 10HFZ-L WING,,4H N ,10HFZ-STAB, N,2H ,10HFZ-FUS, N   DATA0057
1,1H ,10HFZ-RT JET,,4H N ,10HFZ-LEFT JE,6HT, N ,10HFZ-REACT J,     DATA0058
2 8HETS, N ,10HFZ-LIFT JE,7HTS, N ,10HFZ-INLET, ,1HN,              DATA0059
3 10HFZ-WEIGHT,,4H N ,10HFZ-INTERFE,10HRENCE, N /                  DATA0060
 DATA PLOTK /9HRM-TOTAL,,6HN.M ,10HRM-R WING,,7H N.M ,             DATA0061
1 10HRM-L WING,,7H N.M ,10HRM-STAB, N,5H.M ,10HRM-FUS, N.,         DATA0062
2 4HM ,10HRM-RT JET,,7H N.M ,10HRM-LEFT JE,9HT, N.M ,              DATA0063
3 10HRM-REACT J,10HTS, N.M ,10HRM-LIFT JE,10HTS, N.M ,             DATA0064
4 10HRM-INLET, ,4HN.M /                                            DATA0065
 DATA PLOTL / 10HRM-FIN, N.,4HM ,10HRM-GYRO, N,5H.M ,              DATA0066
1 10HRM-INTERFE,10HRE, N.M ,9HPM-TOTAL,,6HN.M ,10HPM-R WING,,      DATA0067
2 7H N.M ,10HPM-L WING,,7H N.M ,10HPM-STAB, N,5H.M ,               DATA0068
3 10HPM-FUS, N.,4HM ,10HPM-RT JET,,7H N.M ,10HPM-LEFT JE,          DATA0069
4 9HT, N.M /                                                       DATA0070
 DATA PLOTM / 10HPM-REACT J,10HTS, N.M ,10HPM-LIFT JE,             DATA0071
1 10HTS, N.M ,10HPM-INLET, ,4HN.M ,10HPM-FIN, N.,4HM ,             DATA0072
2 10HPM-GYRO, N,5H.M ,10HPM-INTERFE,10HRE, N.M ,9HYM-TOTAL,,       DATA0073
3 6HN.M ,10HYM-R WING,,7H N.M ,10HYM-L WING,,7H N.M ,              DATA0074
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     4 10HYM-STAR, N,5H,M   /                                                  DATA0075
      DATA PLOTN / 10HYM-FUS, N,,4HM   ,10HYM-RT JET,,7H N,M    ,             DATA0076
     1 10HYM-LEFT JE,9HT, N,M    ,10HYM-REACT J,10HTS, N,M    ,               DATA0077
     2 10HYM-LIFT JE,10HTS, N,M    ,10HYM-INLET, ,4HN,M ,10HYM-FIN, N,,      DATA0078
     3 4HM    ,10HYM-GYRO, N,5H,M    ,10HYM-INTERFE,10HRE, N,M    ,2*1H /    DATA0079
      END                                                                      DATA0080

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      SUBROUTINE DET                                                           DET00001
      COMMON /STRD/ UX,UY,U0,V0,T,A(9,2),N,NS,G(6,2),SLIM,ID,IL                DET00002
      N1=N-1                                                                   DET00003
      K=0                                                                      DET00004
      UD=1.                                                                    DET00005
      VD=0.                                                                    DET00006
      DO 240 L=1,N1                                                            DET00007
      J=K+L                                                                    DET00008
      JN=J+N                                                                   DET00009
      J1=J+1                                                                   DET00010
      K=K+N                                                                    DET00011
      IF(UY.NE.0.) GO TO 110                                                   DET00012
      IF(A(J,1))50,10,50                                                       DET00013
   10 DO 20 I=J1,K                                                             DET00014
      IF(A(I,1))30,20,30                                                       DET00015
   20 CONTINUE                                                                 DET00016
      GO TO 250                                                                DET00017
   30 UD=-UD                                                                   DET00018
      IM=I-J                                                                   DET00019
      DO 40 I=J,NS,N                                                           DET00020
      &MM=I+IM                                                                 DET00021
      B=A(I,1)                                                                 DET00022
      A(I,1)=A(IMM,1)                                                          DET00023
   40 A(IMM,1)=B                                                               DET00024
   50 UD=UD*A(J,1)                                                             DET00025
      XD=-1./A(J,1)                                                            DET00026
      DO 60  I=J1,K                                                            DET00027
      IF(A(I,1).NE.0. ) A(I,1) = A(I,1)*XD                                     DET00028
   60 CONTINUE                                                                 DET00029
      DO 100 M=JN,NS,N                                                         DET00030
      IF(A(M,1))70,100,70                                                      DET00031
   70 MJ=M-J                                                                   DET00032
      DO 90 I=J1,K                                                             DET00033
      &F(A(I,1))80,90,80                                                       DET00034
   80 IC=MJ+I                                                                  DET00035
      A(IC,1)= A(IC,1)+A(I,1)*A(M,1)                                           DET00036
   90 CONTINUE                                                                 DET00037
  100 CONTINUE                                                                 DET00038
      GO TO 240                                                                DET00039
  110 IF(A(J,1). NE. 0..OR. A(J,2). NE. 0. ) GO TO 150                         DET00040
      DO 120  I=J1,K                                                           DET00041
      &F( A(I,1). NE. 0..OR. A(I,2) .NE. 0. ) GO TO 130                        DET00042
  120 CONTINUE                                                                 DET00043
      GO TO 250                                                                DET00044
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130 UD=-UO                                                          DET00045
    VD=-VO                                                          DET00046
    &M=9-J                                                          DET00047
    DO 140 I=J,NS,N                                                 DET00048
    IMM=I+IM                                                        DET00049
    DO 140 M=1,2                                                    DET00050
    B=1(I,M)                                                        DET00051
    AE(I,M)=A(IMM,M)                                                DET00052
140 AE(IMM,M)=B                                                     DET00053
150 C=UD*A(J,1)-VD*A(J,2)                                           DET00054
    VD=UD*A(J,2)+VD*A(J,1)                                          DET00055
    UO=C                                                            DET00056
    &F(A(J,1))170,160,170                                           DET00057
160 XD=0.                                                           DET00058
    YD=1./A(J,2)                                                    DET00059
    GO TO 180                                                       DET00060
170 X=1(J,2)/    A(J,1)                                             DET00061
    XM=(1.+XR*XR)*A(J,1)                                            DET00062
    XD=-1./XM                                                       DET00063
    YD=XR/XM                                                        DET00064
180 DO 210 I=J1,K                                                   DET00065
190 B=XD*A(I,1) -YD* A(I,2)                                         DET00066
    AE(I,2)= XD*A(I,2)+YD*A(I,1)                                    DET00067
200 A(I,1)= B                                                       DET00068
210 CONTINUE                                                        DET00069
    DO 230 M=JN,NS,N                                                DET00070
    IF( A(M,1).EQ.0..AND.A(M,2) .EQ. 0. ) GO TO 230                 DET00071
    MJ=M-J                                                          DET00072
    DO 220 I=J1,K                                                   DET00073
    IF( A(I,1).EQ.0..AND. A(I,2) .EQ. 0. ) GO TO 220                DET00074
    &C=MJ+I                                                         DET00075
    A(IC,1)=A(IC,1)+A(I,1)*A(M,1)-A(I,2)*A(M,2)                     DET00076
    A(IC,2)=A(IC,2)+A(I,1)*A(M,2)+A(I,2)*A(M,1)                     DET00077
220 CONTINUE                                                        DET00078
230 CONTINUE                                                        DET00079
240 CONTINUE                                                        DET00080
    &F(UY)260,260,280                                               DET00081
250 UD=0.                                                           DET00082
260 UO=UD*A(NS,1)                                                   DET00083
270 VO=0.                                                           DET00084
    RETURN                                                          DET00085
280 UO=UD*A(NS,1)-VD*A(NS,2)                                        DET00086
    VO=UD*A(NS,2)+VD*A(NS,1)                                        DET00087
    RETURN                                                          DET00088
    END                                                             DET00089

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    SUBROUTINE ELEC (GAIN)                                          ELEC0001
    COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,      ELEC0002
   1                INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)          ELEC0003
    GAIN=1.                                                         ELEC0004
    IX=INDEX*3                                                      ELEC0005
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```
      DO 40 I=1,NUMRTS                                                  ELEC0006
      IX=IX+1                                                           ELEC0007
      U=UU(I)                                                           ELEC0008
      V=VV(I)                                                           ELEC0009
      IF(V.EQ.0.) GO TO 10                                              ELEC0010
      IF(V.NE.-VV(I+1)) GO TO 20                                        ELEC0011
      Z=1./(U**2+V**2)                                                  ELEC0012
      TAU(IX)=Z                                                         ELEC0013
      DAMP(IX)=-2.*Z*U                                                  ELEC0014
      GAIN=GAIN/Z                                                       ELEC0015
      GO TO 40                                                          ELEC0016
   10 CONTINUE                                                          ELEC0017
      IF(U.EQ.0.) GO TO 20                                              ELEC0018
      DAMP(IX)=-1./U                                                    ELEC0019
      GAIN=-GAIN*U                                                      ELEC0020
      GO TO 30                                                          ELEC0021
   20 CONTINUE                                                          ELEC0022
      DAMP(IX)=0.                                                       ELEC0023
   30 CONTINUE                                                          ELEC0024
      TAU(IX)=0.                                                        ELEC0025
   40 CONTINUE                                                          ELEC0026
      IF(NUMRTS.GE.3) RETURN                                            ELEC0027
      IX=IX+1                                                           ELEC0028
      TAU(IX)=0.                                                        ELEC0029
      DAMP(IX)=0.                                                       ELEC0030
      UU(3)=0.                                                          ELEC0031
      VV(3)=0.                                                          ELEC0032
      RETURN                                                            ELEC0033
      END                                                               ELEC0034
```

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      SUBROUTINE GUST (J)                                               GUS00001
      COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARBG,ASEP,AYBG,CGBL,DPIX,DPIZ, GUS00002
     1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,RMASS,   GUS00003
     2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R, GUS00004
     3                P01DTR,RDELT1,RDELT2                              GUS00005
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,      GUS00006
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELF,  GUS00007
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,  GUS00008
     3                XAELF,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,  GUS00009
     4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,      GUS00010
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1         GUS00011
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,     GUS00012
     1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,    GUS00013
     2                LNGTH1,PILGH1,START2                              GUS00014
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,GUS00015
     1                YGUSTF,GFWD,GLAT,GVERT,VXH,VZH,APD,VYH,ARD,AYD,   GUS00016
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE            GUS00017
      COMMON /STANRO/ J1,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,  GUS00018
     1                PILGH2,PWGEL1                                     GUS00019
      REAL LNGTH1                                                       GUS00020
      DIMENSION XSTA(7),AGUST(7)                                        GUS00021
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```
      XSTA(1)=SQRT(XX**2+YY**2)-XGUST                                    GUS00022
      CALL VR3D (XAFIN,YAFIN,ZAFIN,AYE,APE,ARE,STA,BL,TV,1)              GUS00023
      XSTA(2)=SQRT((XX+STA)**2+(YY+BL)**2)-XGUST                         GUS00024
      CALL VR3D (XAELF,0.,ZAELF,AYE,APE,ARE,STA,BL,TV,1)                 GUS00025
      XSTA(3)=SQRT((XX+STA)**2+(YY+BL)**2)-XGUST                         GUS00026
      CALL VR3D (XAWG,0.,ZAWG,AYE,APE,ARE,STA,BL,TV,1)                   GUS00027
      XSTAW=SQRT((XX+STA)**2+(YY+BL)**2)-XGUST                           GUS00028
      K=7                                                                GUS00029
      IF(QWG.LT.0) K=4                                                   GUS00030
      DO 10 M=1,4                                                        GUS00031
      AGUST(M)=0.                                                        GUS00032
      AGUST(M+3)=0.                                                      GUS00033
      BILL=M                                                             GUS00034
      &FEQWG.LT.0) BILL=2.                                               GUS00035
   10 XSTA(M+3)=XSTAW+(.5-.25*BILL)*CWING                                GUS00036
      GUSTYP=J                                                           GUS00037
      IF(J.EQ.10.OR.J.EQ.12) GO TO 60                                    GUS00038
      DO 50 M=1,K                                                        GUS00039
      IF(XSTA(M).GE.LNGTH1) GO TO 20                                     GUS00040
      &F(XSTA(M).LE.0.) GO TO 50                                         GUS00041
      AGUST(M)=XSTA(M)*RATE1                                             GUS00042
      GO TO 50                                                           GUS00043
   20 IF(XSTA(M).GE.STOP2) GO TO 30                                      GUS00044
      IF(XSTA(M).LE.START2) GO TO 40                                     GUS00045
      AGUST(M)=GMAXV3+XSTA(M)*RATE2                                      GUS00046
      GO TO 50                                                           GUS00047
   30 AGUST(M)=GMAXV                                                     GUS00048
      GO TO 50                                                           GUS00049
   40 AGUST(M)=GMAXV1                                                    GUS00050
   50 CONTINUE                                                           GUS00051
      GO TO 80                                                           GUS00052
   60 DO 70 M=1,K                                                        GUS00053
      IF(XSTA(M).GT.0.0.AND.XSTA(M).LT.LNGTH1)                           GUS00054
     1    AGUST(M)=GMAXV1*(SIN(XSTA(M)*PILGH1))**2                      GUS00055
      IF(XSTA(M).GT.START2.AND.XSTA(M).LT.STOP2)                         GUS00056
     1    AGUST(M)=GMAXV2*(SIN((XSTA(M)-START2)*PILGH2))**2              GUS00057
   70 CONTINUE                                                           GUS00058
   80 BGUSTW=AGUST(4)                                                    GUS00059
      IF(K.EQ.7) BGUSTW=.25*(AGUST(4)+AGUST(5)+AGUST(6)+AGUST(7))        GUS00060
      IF(J.GT.10) GO TO 90                                               GUS00061
      CALL VR3D (0.,0.,BGUSTW,AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)      GUS00062
      CALL VR3D (0.,0.,AGUST(3),AYE,APE,ARE,HGUSTE,TV,VGUSTE,-1)        GUS00063
      CALL VR3D (0.,0.,AGUST(2),AYE,APE,ARE,HGUSTF,YGUSTF,TV,-1)        GUS00064
      CALL VR3D (0.,0.,AGUST(1),AYE,APE,ARE,HGUST,YGUST,VGUST,-1)       GUS00065
      RETURN                                                             GUS00066
   90 CALL VR3D (AGUSTW,0.,0.,AYE,APE,ARE,HGUSTW,YGUSTW,VGUSTW,-1)      GUS00067
      CALL VR3D (AGUST(3),0.,0.,AYE,APE,ARE,HGUSTE,TV,VGUSTE,-1)        GUS00068
      CALL VR3D (AGUST(2),0.,0.,AYE,APE,ARE,HGUSTF,YGUSTF,TV,-1)        GUS00069
      CALL VR3D (AGUST(1),0.,0.,AYE,APE,ARE,HGUST,YGUST,VGUST,-1)       GUS00070
      RETURN                                                             GUS00071
      END                                                                GUS00072
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      SUBROUTINE INIT                                                    INIT0001
      COMMON /FORCE/  A(74)                                              INIT0002
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,     INIT0003
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),     INIT0004
     2                TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,      INIT0005
     3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,         INIT0006
     4                TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,        INIT0007
     5                ZDELT1,ZDELT2                                      INIT0008
      COMMON /STAMAN/ XX,YY,AY1,RIY,APHG,ARHG,ASEP,AYHG,CGBL,DPIX,DPIZ,  INIT0009
     1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,PMASS,    INIT0010
     2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R,  INIT0011
     3                P010TR,RDELT1,RDELT2                               INIT0012
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,       INIT0013
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,   INIT0014
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,   INIT0015
     3                XAELF,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,   INIT0016
     4                YAELF,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,       INIT0017
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1          INIT0018
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,      INIT0019
     1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,     INIT0020
     2                LNGTH1,PILGH1,START2                               INIT0021
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW, INIT0022
     1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD,    INIT0023
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE             INIT0024
     3               ,TLSTK(2),THLSTK(2),DUM(6),DFLAP1                   INIT0025
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                    INIT0026
     1                NPART,NVAPA,NVARB,NVARC,NSCALE                     INIT0027
     1               ,NVARS,NPRINT,NTIME                                 INIT0028
      COMMON /FORY/   Y(4,150)                                           INIT0029
      COMMON /LJETS/  NJETL,ATEM(92),TLJET(6),BTEM(25),DPBJTL(6)         INIT0030
      COMMON /RJETS/ NJETR,XSTK(3),CTEM(114),TJETR(10)                   INIT0031
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3)           INIT0032
      DIMENSION PAR(135),AI(74)                                          INIT0033
      DATA  DTRR1/57.2957795/                                            INIT0034
      DATA LR,LW/5,6/                                                    INIT0035
      DATA XNP,FM,XIC,FPNM/4.4482,.3048,2.54,1.3558/                     INIT0036
      DO 10 J=1,3                                                        INIT0037
      JJ=4-J                                                             INIT0038
      PAR(J+70)=Y(1,J+89)*FM                                             INIT0039
      PAR(J+76)=Y(1,J+14)*FM                                             INIT0040
      PAR(J+82)=Y(1,J+75)*FM                                             INIT0041
      PAR(J+85)=Y(1,JJ+76)*DTRR1                                         INIT0042
      PAR(J+89)=Y(1,J)*FM                                                INIT0043
      PAR(J+92)=Y(1,JJ+3)*DTRR1                                          INIT0044
      PAR(J+96)=Y(1,J+84)*DTRR1                                          INIT0045
      PAR(J+99)=Y(1,J+ 9)*DTRR1                                          INIT0046
   10 CONTINUE                                                           INIT0047
      DO 20 J=1,6                                                        INIT0048
      PAR(J)=TLJET(J)*XNP                                                INIT0049
   20 PAR(J+6)=DPBJTL(J)*57.2957795                                      INIT0050
      DO 30 J=1,10                                                       INIT0051
   30 PAR(12+J)=TJETR(J)*XNP                                             INIT0052
      PAR(23)=XSTK(1)*XIC                                                INIT0053
      PAR(24)=DELTA(1)*DTRR1                                             INIT0054
      PAR(25)=XSTK(2)*XIC                                                INIT0055
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      PAR(26)=DFLTA(2)*DTRR1                                    INIT0056
      PAR(27)=RPCT(1)*100.                                      INIT0057
      PAR(28)=THR(1)*DTRR1                                      INIT0058
      PAR(29)=DFLTA(4)*DTRR1                                    INIT0059
      PAR(30)=RPCT(2)*100.                                      INIT0060
      PAR(31)=THR(2)*DTRR1                                      INIT0061
      PAR(32)=XSTK(3)*XIC                                       INIT0062
      PAR(33)=DFLTA(3)*DTRR1                                    INIT0063
      PAR(34)=RPCT(3)*100.                                      INIT0064
      PAR(70)=DFLAP1                                            INIT0065
      PAR(74)=DIST*FM                                           INIT0066
      PAR(75)=V*FTKTS                                           INIT0067
      PAR(76)=AYFP*DTRR                                         INIT0068
      PAR(80)=-PAR(74)                                          INIT0069
      PAR(81)=VW*FTKTS                                          INIT0070
      PAR(82)=APFP*DTRR                                         INIT0071
      PAR(89)=Y(1,89)*DTRR1                                     INIT0072
      PAR(96)=Y(1,14)*DTRR1                                     INIT0073
      PAR(103)=COLSTK                                           INIT0074
      PAR(104)=CYSTK1                                           INIT0075
      PAR(105)=ALLWG*DTRR                                       INIT0076
      PAR(106)=ALRWG*DTRR                                       INIT0077
      PAR(107)=ALELE*DTRR                                       INIT0078
      PAR(108)=ALFIN*DTRR                                       INIT0079
      PAR(109)=AY*DTRR                                          INIT0080
      PAR(110)=CGSTA*XIC                                        INIT0081
      PAR(111)=RGUST                                            INIT0082
      PAR(112)=-GFWD                                            INIT0083
      PAR(113)=CYSTK2                                           INIT0084
      PAR(114)=CLLWG                                            INIT0085
      PAR(115)=CLRWG                                            INIT0086
      PAR(116)=CLELE                                            INIT0087
      PAR(117)=CLFIN                                            INIT0088
      PAR(118)=AP*DTRR                                          INIT0089
      PAR(119)=CGHL*XIC                                         INIT0090
      PAR(120)=YGUST                                            INIT0091
      PAR(121)=-GLAT                                            INIT0092
      PAR(122)=PEDAL                                            INIT0093
      PAR(123)=CDLWG                                            INIT0094
      PAR(124)=CDRWG                                            INIT0095
      PAR(125)=CDELE                                            INIT0096
      PAR(126)=CDFIN                                            INIT0097
      PAR(127)=CGWL*XIC                                         INIT0098
      PAR(128)=VGUST                                            INIT0099
      PAR(129)=GVERT                                            INIT0100
      PAR(130)=TLSTK(1)                                         INIT0101
      PAR(131)=TLSTK(2)                                         INIT0102
      PAR(132)=THLSTK(1)                                        INIT0103
      PAR(133)=TAXR*XNP                                         INIT0104
      PAR(134)=THLSTK(2)                                        INIT0105
      PAR(135)=TAXL*XNP                                         INIT0106
      DO 40 K=1,35                                              INIT0107
   40 A1(K)=A(K)*XNP                                            INIT0108
      DO 50 K=36,74                                             INIT0109
   50 A1(K)=A(K)*FPNM                                           INIT0110
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      IF(NPART.EQ.1.OR.NPART.EQ.7.OR.NPART.EQ.10.OR.NPART.EQ.9) GO TO 60INIT0111
      WRITE(3) IPSN,T,PAR,A1                                          INIT0112
C     TIME, 135 PAR-S, 74 A-S                                         INIT0113
      NTIME=NTIME+1                                                   INIT0114
      IF(NTIME.GE.NPRINT) NTIME=0                                     INIT0115
      IF(NTIME.NE.0) RETURN                                           INIT0116
   60 CONTINUE                                                        INIT0117
      CALL TIMEX(TUSED,DTIME,TLEFT)                                   INIT0118
      WRITE (LW,70) T,TUSED                                           INIT0119
      WRITE (LW,80) (PAR(J),J=71,82)                                  INIT0120
      WRITE (LW,90) (PAR(J),J=83,102)                                 INIT0121
      WRITE (LW,100) (PAR(J),J=103,129)                               INIT0122
      WRITE (LW,110)(PAR(J),J=130,135),DFLAP1                         INIT0123
      CALL WRFM                                                       INIT0124
      WRITE (LW,120) (PAR(J),J=1,22)                                  INIT0125
      WRITE (6,130) (PAR(J),J=23,34)                                  INIT0126
      RETURN                                                          INIT0127
   70 FORMAT (1H1,10X,F8.3,3X,21HSECONDS MANEUVER TIME,10X,           INIT0128
     1         F8.3,3X,30HMINUTES ELAPSED COMPUTING TIME,5X,          INIT0129
     2         28HNEWTONS,METRES,DEG,SEC UNITS)                       INIT0130
   80 FORMAT (1H0,56X,16HGROUND REFERENCE,/                           INIT0131
     1         38X,1HX,9X,1HY,9X,1HZ,24X,28HSPEED (KTS)  FLT PATH ANGLES/INIT0132
     2         22X,10HVELOCITY  ,3F10.3,11H  DISTANCE ,F8.1,         INIT0133
     3         6H  AIR ,F7.2,10H  HEADING ,F8.3/                     INIT0134
     4         22X,10HLOCATION  ,3F10.3,11H  ALTITUDE ,F8.1,         INIT0135
     5         6H  GND ,F7.2,10H  CLIMB   ,F8.3)                     INIT0136
   90 FORMAT (1H0,57X,18HFUSELAGE REFERENCE,/                         INIT0137
     1         20X,1HU,9X,1HV,9X,1HW,9X,1HP,9X,1HQ,9X,1HR,           INIT0138
     2         17X,24HEULER ANGLES FROM GROUND,/                      INIT0139
     3         5X,5HACCEL,5X,7F10.3,1X,3HPSI,6X,5HTHETA,6X,3HPHI,/    INIT0140
     4         5X,10HVELOCITY  ,7F10.3,3X,10HVELOCITY  ,3F10.3,/      INIT0141
     5         88X,10HLOCATION  ,3F10.3)                              INIT0142
  100 FORMAT (1H0,6X,13HCONTROL (PCT),/                               INIT0143
     1         7X,8HTHROTTLE,3X,F7.2,8X,16HL. WING  R. WING,          INIT0144
     2         4X,5HHSTAB,4X,15HVSTAB  FUSELAGE,7X,13HC.G. LOC (CM),  INIT0145
     3         6X,15HGUST (CG)   G-S,/                                INIT0146
     4         7X,11HLONG STICK ,F7.2,6H  ATK ,4F9.3,                 INIT0147
     5         7H  ATKY ,F8.3,12H  STA. LINE ,F7.2,                   INIT0148
     6         7H  FWD  ,F5.1,7H  FWD  ,F5.2,/                        INIT0149
     7         7X,11HLAT STICK  ,F7.2,6H  CL  ,4F9.3,                 INIT0150
     8         7H  ATKP ,F8.3,12H  B. LINE   ,F7.2,                   INIT0151
     9         7H  LAT  ,F5.1,7H  LAT  ,F5.2,/                        INIT0152
     A         7X,5HPEDAL,6X,F7.2,6H  CD  ,4F9.3,17X,10HW. LINE   ,F7.2, INIT0153
     B         7H  VERT ,F5.1,7H  VERT ,F5.2)                         INIT0154
  110 FORMAT (7X,11HL THROT 1  ,F7.2/7X,11HL THROT 2  ,F7.2,10X,6HFIXED INIT0155
     1        ,10HJET THRUST/7X,11HL ANGLE 1  ,F7.2,10X,12HRIGHT/CENTER, INIT0156
     2         F8.1,/7X,11HL ANGLE 2  ,F7.2,10X,4HLEFT,8X,F8.1,       INIT0157
     3         10X,16HFLAP DEFL. (DEG),F8.1)                          INIT0158
  120 FORMAT (1H0,57X,19HMOVABLE JET SUMMARY,/1H ,10H  NOZZLE  ,4X,1H1, INIT0159
     1         8X,1H2,8X,1H3,8X,1H4,8X,1H5,8X,1H6/11H   THRUST  ,     INIT0160
     2         6F9.1/11H   THETA-J ,6F9.1//1H0,56X,                   INIT0161
     3         20HREACTION JET SUMMARY/11H   NOZZLE  ,4X,1H1,8X,1H2,8X, INIT0162
     4         1H3,8X,1H4,8X,1H5,8X,1H6,8X,1H7,8X,1H8,8X,1H9,8X,2H10/ INIT0163
     5         11H   THRUST  ,10F9.1)                                 INIT0164
  130 FORMAT (1H0,59X,15HCONTROL SUMMARY/27H   CONTROL DEFLECTIONS (CM),INIT0165
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     1        9X,25HSURFACE DEFLECTIONS (DEG),27X,8HRCS DATA,//  .          INIT0166
     2        17H  LONG STICK     ,F6.2,12X,10HSTABILIZER,7X,F6.2,27X,     INIT0167
     3        20HPCT       THETA (DEG)/17H  LAT  STICK      ,F6.2,12X,     INIT0168
     4        8HAILERONS,9X,F6.2,17X,3HFWD,6X,F5.1,8X,F5.2/35X,            INIT0169
     5        8HSPOILERS,9X,F6.2,17X,3HAFT,6X,F5.1,8X,F5.2/34X  PEDALS,    INIT0170
     6        9X,F6.2,12X,6HRUDDER,11X,F6.2,17X,9HLEFT/RT  ,F5.1)          INIT0171
      END                                                                   INIT0172
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      SUBROUTINE ITRIM(LPASS)                                               ITRI0001
      COMMON /STRIAM/ E(74),F(6),X(6),T1(9),PD(6,7),T2(2),ERR(6),KM1,       ITRI0002
     1                T3(242),DAMP,T4(12),EPDX(11),T5(83),NPASS,            ITRI0003
     2                POPHI(6,7),T6(3),MXPASS,XLIMIT                        ITRI0004
      COMMON /MANAL/  T7(5),TAXL,TAXR,T8(36),HALFPI                         ITRI0005
      COMMON /MANARO/ T9(13),VXB,VZB,APD,VYB,ARD,AYD,                       ITRI0006
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE                ITRI0007
     3               ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH               ITRI0008
      COMMON /STANRO/ J,W,T10(7),COND1                                      ITRI0009
      COMMON /TOPLOT/ AH(3),AL(3),EXIT                                      ITRI0010
      COMMON /FORY/   Y(4,150)                                              ITRI0011
      DIMENSION VAR(11),PM(6,7)                                             ITRI0012
      EQUIVALENCE (VAR(1),COLSTK)                                           ITRI0013
      KOUNT=7                                                               ITRI0014
      KM1=KOUNT-1                                                           ITRI0015
      NPASS=0                                                               ITRI0016
      KPASS=-1                                                              ITRI0017
      CALL TIMEX (TUSED,DTIME,TLEFT)                                        ITRI0018
   10 NPASS=NPASS+1                                                         ITRI0019
      KPASS=KPASS+1                                                         ITRI0020
      IF(KPASS.EQ.LPASS) KPASS=0                                            ITRI0021
      IF(COND1.NE.0.) WRITE (6,150) NPASS                                   ITRI0022
      J=1                                                                   ITRI0023
      CALL AJACOB                                                           ITRI0024
      IF(EXIT.NE.0.) GO TO 110                                              ITRI0025
      DO 20 K=1,KM1                                                         ITRI0026
   20 PD(K,KOUNT)=-F(K)                                                     ITRI0027
      DO 30 K=1,KM1                                                         ITRI0028
      IF(ABS(F(K)).GT.DAMP) GO TO 40                                        ITRI0029
   30 CONTINUE                                                              ITRI0030
      CALL DAMPER                                                           ITRI0031
   40 CONTINUE                                                              ITRI0032
      DO 50 K=1,KM1                                                         ITRI0033
      IF(ABS(F(K)).GT.ERR(K)) GO TO 60                                      ITRI0034
   50 CONTINUE                                                              ITRI0035
      GO TO 120                                                             ITRI0036
   60 CONTINUE                                                              ITRI0037
      IF(KPASS.GT.0) GO TO 80                                               ITRI0038
      J=2                                                                   ITRI0039
      CALL JACOBI                                                           ITRI0040
      IF(EXIT.NE.0.) GO TO 110                                              ITRI0041
      IF(KOUNT.EQ.7)                                                        ITRI0042
     1   CALL VR3D (Y(1,90),Y(1,91),Y(1,92),AYE,APE,ARE,VXB,VYB,VZB,-1)     ITRI0043
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      DO 70 I=1,6                                                          ITRI0044
      F1=4.44822                                                           ITRI0045
      IF(I.GT.3) F1=1.35582                                                ITRI0046
      DO 70 J=1,7                                                          ITRI0047
   70 PM(I,J)=PD(I,J)*F1                                                   ITRI0048
      IF(COND1.NE.0.) CALL *RVP (2,VAR,KM1,PM,TAXL,TAXR)                   ITRI0049
   80 CONTINUE                                                             ITRI0050
      DO 90 J=1,KOUNT                                                      ITRI0051
      DO 90 I=1,KM1                                                        ITRI0052
   90 PDPHI(I,J)=PD(I,J)                                                   ITRI0053
      CALL SOLVE                                                           ITRI0054
      IF(EXIT.NE.0.) GO TO 130                                             ITRI0055
      CALL RATI (X,EPDX,XLIMIT,VAR,AT,BT,CT,ATH,BTH,CTH)                   ITRI0056
      DO 100 I=6,7                                                         ITRI0057
      IF(ABS(VAR(I)).GT.HALFPI) GO TO 110                                  ITRI0058
  100 CONTINUE                                                             ITRI0059
      IF(NPASS.LT.MXPASS)GO TO 10                                          ITRI0060
  110 EXIT=1.                                                              ITRI0061
  120 CONTINUE                                                             ITRI0062
      CALL PARA (W,COND1)                                                  ITRI0063
      RETURN                                                               ITRI0064
  130 CONTINUE                                                             ITRI0065
      WRITE (6,140)                                                        ITRI0066
      RETURN                                                               ITRI0067
  140 FORMAT (1H0,41HTHE PARTIAL DERIVATIVE MATRIX IS SINGULAR./           ITRI0068
     152H THIS IS PROBABLY DUE TO A CONTROL BEING UNCONNECTED)             ITRI0069
  150 FORMAT (1H1/1H ,50X,25H***** START OF ITERATION ,I3,6H *****)        ITRI0070
      END                                                                  ITRI0071
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      SUBROUTINE IVAR (EXIT,LINK,TAXL,TAXR,PILGH2)                         IVAR0001
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,       IVAR0002
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),       IVAR0003
     2                TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,        IVAR0004
     3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,           IVAR0005
     4                TSTAB(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,          IVAR0006
     5                ZDELT1,ZDELT2                                        IVAR0007
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,        IVAR0008
     1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,       IVAR0009
     2                LNGTH1,PILGH1,START2,DDA1,DDA2,DDA3                  IVAR0010
      COMMON /LJETS/  NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6),       IVAR0011
     1                ARBJTL(6),CONLJ(2,5),NCONL(6)                        IVAR0012
      COMMON /MFT1/ T1(553),XCM(20,6)                                      IVAR0012
      REAL LNGTH1,LNGTH2                                                   IVAR0013
      DIMENSION TAX(2)                                                     IVAR0014
      DATA DTR,TWOPI/.1745329E-01,6.283185/                                IVAR0015
      XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3))                              IVAR0016
      TAX(1)=TAXL                                                          IVAR0017
      TAX(2)=TAXR                                                          IVAR0018
      DO 280 L=1,KREAD                                                     IVAR0019
      J=KCIT(L)                                                            IVAR0020
      IF(J.LT.1.OR.J.GT.31) GO TO 290                                      IVAR0021
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      IF(LINK.EQ.1) GO TO 10                                                    IVAR0022
      IF(J.EQ.14) GO TO 140                                                     IVAR0023
      IF(J.EQ.21) GO TO 290                                                     IVAR0024
      IF(J.EQ.22) GO TO 290                                                     IVAR0025
      GO TO 280                                                                 IVAR0026
   10 CONTINUE                                                                  IVAR0027
      WRITE (6,300) J,(XCM (L,K),K=1,6)                                         IVAR0028
      IF(J.GT.8) GO TO 110                                                      IVAR0029
      GO TO (20,30,40,50,60,70,80,90),J                                         IVAR0030
   20 DA=100./COLL(1)                                                           IVAR0031
      GO TO 100                                                                 IVAR0032
   30 DA=100./CYCF(1)                                                           IVAR0033
      GO TO 100                                                                 IVAR0034
   40 DA=100./CYCL(1)                                                           IVAR0035
      GO TO 100                                                                 IVAR0036
   50 DA=100./PEDA(1)                                                           IVAR0037
      GO TO 100                                                                 IVAR0038
   60 DA=100./CONLJ(1,1)                                                        IVAR0039
      GO TO 100                                                                 IVAR0040
   70 DA=100./CONLJ(2,1)                                                        IVAR0041
      GO TO 100                                                                 IVAR0042
   80 DA=100./CONLJ(1,2)                                                        IVAR0043
      GO TO 100                                                                 IVAR0044
   90 DA=100./CONLJ(2,2)                                                        IVAR0045
  100 XCIT(L,2)=XCIT(L,2)*DA                                                    IVAR0046
      XCIT(L,5)=XCIT(L,5)*DA                                                    IVAR0047
      IF(XCIT(L,3).EQ.0.) GO TO 280                                             IVAR0048
      IF(XCIT(L,4).GE.XCIT(L,3).AND.XCIT(L,6).GE.XCIT(L,4)) GO TO 280           IVAR0049
      XCIT(L,4)=9999.                                                           IVAR0050
      XCIT(L,6)=9999.                                                           IVAR0051
      GO TO 280                                                                 IVAR0052
  110 IF(J.GT.12) GO TO 130                                                     IVAR0053
      XGUST=XCIT(L,1)                                                           IVAR0054
      GMAXV1=XCIT(L,2)                                                          IVAR0055
      LNGTH1=XCIT(L,3)                                                          IVAR0056
      START2=XCIT(L,4)+LNGTH1                                                   IVAR0057
      LNGTH2=XCIT(L,5)                                                          IVAR0058
      GMAXV2=XCIT(L,6)                                                          IVAR0059
      STOP2=START2+LNGTH2                                                       IVAR0060
      IF(J.EQ.10.OR.J.EQ.12) GO TO 120                                          IVAR0061
      RATE1=0.                                                                  IVAR0062
      IF(LNGTH1.NE.0.) RATE1=GMAXV1/LNGTH1                                      IVAR0063
      RATE2=0.                                                                  IVAR0064
      IF(LNGTH2.NE.0.) RATE2=GMAXV2/LNGTH2                                      IVAR0065
      GMAXV=GMAXV1+GMAXV2                                                       IVAR0066
      GMAXV3=GMAXV1-START2*RATE2                                                IVAR0067
      GO TO 280                                                                 IVAR0068
  120 PILGH1=0.                                                                 IVAR0069
      IF(LNGTH1.NE.0.) PILGH1=PI/LNGTH1                                         IVAR0070
      PILGH2=0.                                                                 IVAR0071
      IF(LNGTH2.NE.0.) PILGH2=PI/LNGTH2                                         IVAR0072
      GO TO 280                                                                 IVAR0073
  130 K=J-12                                                                    IVAR0074
      GO TO (280,280,280,280,150,160,170,180,290,280,290,280,280,               IVAR0075
     1       280,290,290,290,290,190),K                                         IVAR0076
```

```
140 INDIC=XCIT(L,2)+.01                                                IVAR007
    IF(INDIC.NE.2) GO TO 280                                           IVAR007
    INDIC=XCIT(L,6)+.01                                                IVAR007
    IF(INDIC.LT.1.OR.INDIC.GT.2) GO TO 290                             IVAR008
    XCIT(L,5)=TAX(INDIC)                                               IVAR008
    XCIT(L,2)=1.                                                       IVAR008
    GO TO 280                                                          IVAR008
150 XCIT(L,2)= XCIT(L,2)*100./(PEDA(1)*DTR)                            IVAR008
    DDA3=0.                                                            IVAR008
    GOTO 280                                                           IVAR008
160 XCIT(L,2)=XCIT(L,2)/CYCL(3)                                        IVAR008
     XCIT(L,3)=XCIT(L,3)/CYCL(3)                                       IVAR008
    DDA2=0.                                                            IVAR008
    GOTO 280                                                           IVAR009
170 CONTINUE                                                           IVAR009
    XCIT(L,2)=XCIT(L,2)/CYCF(3)                                        IVAR009
    XCIT(L,3)=XCIT(L,3)/CYCF(3)                                        IVAR009
    XCIT(L,4)=XCIT(L,4)*DTR                                            IVAR009
    DDA1=0.                                                            IVAR009
    GOTO 280                                                           IVAR009
180 XCIT(L,2)=XCIT(L,2)*TWOPI                                          IVAR009
    XCIT(L,3)=XCIT(L,3)*XCIT(L,2)                                      IVAR009
    K=XCIT(L,5)+.1                                                     IVAR009
    IF(K.LT.1.OR.K.GT.8) GO TO 290                                     IVAR010
    GO TO (200,210,220,230,240,250,260,270),K                          IVAR010
190 CONTINUE                                                           IVAR010
    IF(XCIT(L,3).LE.XCIT(L,1)) XCIT(L,3)=9999.                         IVAR010
    IF(XCIT(L,5).LE.XCIT(L,3)) XCIT(L,5)=99999.                        IVAR010
    GO TO 280                                                          IVAR010
200 CONTINUE                                                           IVAR010
    XCIT(L,3)=XCIT(L,3)*100./COLL(1)                                   IVAR010
    GO TO 280                                                          IVAR010
210 XCIT(L,3)=XCIT(L,3)*100./CYCF(1)                                   IVAR010
    GO TO 280                                                          IVAR011
220 XCIT(L,3)=XCIT(L,3)*100./CYCL(1)                                   IVAR011
    GO TO 280                                                          IVAR011
230 XCIT(L,3)=XCIT(L,3)*100./PEDA(1)                                   IVAR011
    GO TO 280                                                          IVAR011
240 XCIT(L,3)=XCIT(L,3)*100./CONLJ(1,1)                                IVAR011
    GO TO 280                                                          IVAR011
250 XCIT(L,3)=XCIT(L,3)*100./CONLJ(2,1)                                IVAR011
    GO TO 280                                                          IVAR011
260 XCIT(L,3)=XCIT(L,3)*100./CONLJ(1,2)                                IVAR011
    GO TO 280                                                          IVAR012
270 XCIT(L,3)=XCIT(L,3)*100./CONLJ(2,2)                                IVAR012
280 CONTINUE                                                           IVAR012
    RETURN                                                             IVAR012
290 WRITE (6,310) L,J                                                  IVAR012
    EXIT=1.                                                            IVAR012
    RETURN                                                             IVAR012
300 FORMAT (1H ,25X,I10,6F10.3)                                        IVAR012
310 FORMAT (24H0CHECK PART 2 DATA CARD ,I2,11H J CODE IS ,I2)          IVAR012
    END                                                                IVAR012
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      SUBROUTINE JACORI                                                 JAC00001
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,       JAC00002
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RHO,R12,SPD(6,6,1),    JAC00003
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),     JAC00004
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,     JAC00005
     4                DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),   JAC00006
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7), JAC00007
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)JAC00008
     7               ,XLJT(84),YLJT(7)                                  JAC00009
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,JAC00010
     1                YGUSTF,GFWD,GLAT,GVERT,VXH,VZH,APD,VYR,ARD,AYD,   JAC00011
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE            JAC00012
     3               ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH           JAC00013
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                   JAC00014
     1                NPART,NVARA,NVARB,NVARC,NSCALE                    JAC00015
      COMMON /KVARTR/ KVAR(6),PD1                                       JAC00016
      DIMENSION VAR(11),PD1(6,12)                                       JAC00017
      EQUIVALENCE              (VAR (1),COLSTK)                         JAC00018
      DO 20 L=1,KM1                                                     JAC00019
      IF(L.GT.1) VAR(KVAR(L-1))=VAR(KVAR(L-1))-DEPD(KVAR(L-1))          JAC00020
      IF(KVAR(L-1).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))     JAC00021
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)             JAC00022
      IF(KVAR(L-1).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))     JAC00023
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)              JAC00024
      VAR(KVAR(L))=VAR(KVAR(L))+DEPD(KVAR(L))                           JAC00025
      IF(KVAR( L ).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))     JAC00026
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)             JAC00027
      IF(KVAR( L ).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))     JAC00028
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)              JAC00029
      CALL AJACOB                                                       JAC00030
      IF(EXIT.NE.0.) RETURN                                             JAC00031
      DO 10 K=1,KM1                                                     JAC00032
   10 PD(K,L  )=(F(K)+PD(K,KM1+1))/EPD                                  JAC00033
   20 CONTINUE                                                          JAC00034
      VAR(KVAR(KM1))=VAR(KVAR(KM1))-DEPD(KVAR(KM1))                     JAC00035
      IF(KVAR(KM1).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))     JAC00036
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)             JAC00037
      IF(KVAR(KM1).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))     JAC00038
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)              JAC00039
      RETURN                                                            JAC00040
      ENTRY BJACOB                                                      JAC00041
      DO 40 L=1,11                                                      JAC00042
      IF(L.GT.1) VAR(L-1)=VAR(L-1)-DEPD(L-1)                            JAC00043
      IF(    (L-1).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))     JAC00044
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)             JAC00045
      IF(    (L-1).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))     JAC00046
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)              JAC00047
      VAR(L)=VAR(L)+DEPD(L)                                             JAC00048
      IF(    ( L ).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))     JAC00049
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)             JAC00050
      IF(    ( L ).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))     JAC00051
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)              JAC00052
      CALL AJACOB                                                       JAC00053
      IF(EXIT.NE.0.) RETURN                                             JAC00054
      DO 30 K=1,KM1                                                     JAC00055
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 30 PD1(K,L)=(F(K)+PD1(K,12))/EPD                                    JAC00056
 40 CONTINUE                                                         JAC00057
    VAR(11)=VAR(11)-DEPD(11)                                         JAC00058
    RETURN                                                           JAC00059
    END                                                              JAC00060

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    SUBROUTINE JETINT                                                JETI0001
    COMMON /STPIAB/ CTEM(414),XCON(63),ETEM(304),XRAM,ZRAM,RAMM      JETI0002
    COMMON /MANARO/ ITEM,V,VTEM(11),VXB,VZB,APD,VYB                  JETI0003
    COMMON /LJETS/  NJETL,ATEM(18),APBJET(6),RTEMP(68),TLJET(6),     JETI0004
   1          DTEM(6),THLJET(6)                                      JETI0005
    COMMON /FORCE/  XT(9),XIN,XT1(2),XADD,YT(6),YIN,YT1(2),YADD,     JETI0006
   1                ZT(9),ZIN,ZT1,ZADD,RMT(9),RMIN,RMT1(2),RMADD,    JETI0007
   2                PMT(9),PMIN,PMT1(2),PMADD,YMT(9),YMIN,YMT1(2),   JETI0008
   3                YMADD                                            JETI0009
    COMMON /MANAL/  Q,AP                                             JETI0010
    TTOT=0.                                                          JETI0011
    THTOT=0.                                                         JETI0012
    DRX=0.                                                           JETI0013
    DRY=0.                                                           JETI0014
    DRZ=0.                                                           JETI0015
    DO 10 J1=1,NJETL                                                 JETI0016
    TTOT=TTOT+TLJET(J1)                                              JETI0017
 10 THTOT=THTOT+THLJET(J1)-APBJET(J1)                                JETI0018
    THAVE=1.5708*SIN(THTOT/NJETL)                                    JETI0019
    VK=V*.5925                                                       JETI0020
    VKX=VXB*.5925                                                    JETI0021
    VKY=VYB*.5925                                                    JETI0022
    DELL=TTOT*(XCON(50)+(XCON(51)*VKX+XCON(52)*VKX**2+               JETI0023
   1      XCON(53)*VKX**3)*THAVE/(1.5708))                          JETI0024
    DELD=TTOT*(XCON(54)+XCON(55)*VKX)*VKX                            JETI0025
    DELRM=TTOT*(XCON(60)+XCON(61)*VKY)*VKY                           JETI0026
    DELM=TTOT*(XCON(56)+(XCON(57)*VKX+XCON(58)*VKX**2+               JETI0027
   1     XCON(59)*VKX**3)*THAVE/(1.5708))                          JETI0028
    CALL VR20 (-DELD,-DELL,AP,XADD ,ZADD ,1)                         JETI0029
    IF(TTOT.LT.1000.) GOTO 20                                        JETI0030
    DRX=RAMM*VXB                                                     JETI0031
    DRY=RAMM*VYB                                                     JETI0032
    DRZ=RAMM*VZB                                                     JETI0033
 20 YADD=0.                                                          JETI0034
    RMADD=DELRM                                                      JETI0035
    PMADD=DELM                                                       JETI0036
    YMADD=0.                                                         JETI0037
    XIN=-DRX                                                         JETI0038
    YIN=-DRY                                                         JETI0039
    ZIN=-DRZ                                                         JETI0040
    RMIN=-DRY*ZRAM                                                   JETI0041
    PMIN=DRX*ZRAM+DRZ*XRAM                                           JETI0042
    YMIN=-DRY*XRAM                                                   JETI0043
    RETURN                                                           JETI0044
    END                                                              JETI0045
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      SUBROUTINE LAMODE (V,QWG,ZFW,SWING)                                    LAM00001
      COMMON /STRIAG/ E(74),F(6),X(6),UL,DM,DN,DX,DY,DZ,IX,IY,IZ,            LAM00002
     1                PD(6,7),DTR,EPD,ERR(6),XM1,RHO,R12,SPD(6,6,1),         LAM00003
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),          LAM00004
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),ELCG,          LAM00005
     4               XDAMP,DEPD(11),EPDS,EPDX(11),MASS,XLCG,XCON(63),        LAM00006
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),      LAM00007
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)LAM00008
     7               ,XLJT(84),YLJT(7)                                       LAM00009
      COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,             LAM00010
     1                INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)                 LAM00011
      COMMON /MANAL/  Q,ALFA                                                 LAM00012
      DIMENSION PLMODE(6),FLMODE(6),THLFDB(6),IZERON(6),SM(3,9),DMODE(6)LAM00013
     1      ,FANG2(6),ROOOT(2,3),       ZLNT1(6),FANG1(6),ZLNT2(6)           LAM00014
      REAL IX,     IZ,MASS                                                   LAM00015
      COMPLEX ROOOT                                                          LAM00016
      WRITE ( 6,150)                                                         LAM00017
      S1=SIN(ALFA)                                                           LAM00018
      C1=COS(ALFA)                                                           LAM00019
      S2=S1**2                                                               LAM00020
      C2=C1**2                                                               LAM00021
      S1C1=S1*C1                                                             LAM00022
      DO 10 J=1,3                                                            LAM00023
      DO 10 I=1,9                                                            LAM00024
   10 SLOT(J,I)=0.0                                                          LAM00025
      DO 20 I=1,4                                                            LAM00026
      PLMODE(I)=.0                                                           LAM00027
      FLMODE(I)=.0                                                           LAM00028
      THLFDB(I)=.0                                                           LAM00029
      IZERON(I)=0                                                            LAM00030
   20 CONTINUE                                                               LAM00031
      SLOT(1,2)=MASS                                                         LAM00032
      SLOT(1,3)=-SPD(4,4,1)                                                  LAM00033
      SLOT(1,5)=-(SPD(5,4,1)*C1+SPD(6,4,1)*S1)/V                             LAM00034
      SLOT(1,6)=-ZFW/V                                                       LAM00035
      SLOT(1,9)=MASS-(SPD(6,4,1)*C1-SPD(5,4,1)*S1)/V                         LAM00036
      SLOT(2,3)=-(SPD(4,5,1)*C1+SPD(4,6,1)*S1)                               LAM00037
      SLOT(2,4)=(IX*C2+IZ*S2+2.*XFS(11)*S1C1)/V                              LAM00038
      SLOT(2,5)=-(SPD(5,5,1)*C2+(SPD(6,5,1)+SPD(5,6,1))*S1C1                 LAM00039
     1      +SPD(6,6,1)*S2)/V                                                LAM00040
      SLOT(2,8)=-(XFS(11)*C2-.5*(IX-IZ)*S2)/V                                LAM00041
      SLOT(2,9)=-(SPD(6,5,1)*C2+(SPD(6,6,1)-SPD(5,5,1))*S1C1                 LAM00042
     1      -SPD(5,6,1)*S2)/V                                                LAM00043
      SLOT(3,3)=-(SPD(4,6,1)*C1-SPD(4,5,1)*S1)                               LAM00044
      SLOT(3,4)=SLOT(2,8)                                                    LAM00045
      SLOT(3,5)=-(SPD(5,6,1)*C2+(SPD(6,6,1)-SPD(5,5,1))*S1C1                 LAM00046
     1      -SPD(6,5,1)*S2)/V                                                LAM00047
      SLOT(3,8)=(IX*S2+IZ*C2-2.*XFS(11)*S1C1)/V                              LAM00048
      SLOT(3,9)=-(SPD(6,6,1)*C2-(SPD(6,5,1)+SPD(5,6,1))*S1C1                 LAM00049
     1      +SPD(5,5,1)*S2)/V                                                LAM00050
      DO 30 I=1,3                                                            LAM00051
      X1=14.5939                                                             LAM00052
      IF(I.GT.1) X1=4.44822                                                  LAM00053
      DO 30 J=1,9                                                            LAM00054
   30 SM(I,J)=SLOT(I,J)*X1                                                   LAM00055
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      WRITE (6,160)                                                          LAM00056
      WRITE(6,170)((SM(I,J),J=1,9),I=1,3)                                    LAM00057
      WRITE(6,130)                                                           LAM00058
      CALL SRT                                                               LAM00059
      INDEX=6                                                                LAM00060
      CALL ELEC (GAINB)                                                      LAM00061
      DO 60 I=1,NUMRTS                                                       LAM00062
      IF(UU(I).EQ..0.AND.VV(I).EQ..0) GO TO 50                               LAM00063
      IF(VV(I).EQ..0)GO TO 40                                                LAM00064
      PLMODE(I)=6.2832/ABS(VV(I))                                            LAM00065
   40 IF(UU(I).EQ.0.) GO TO 50                                               LAM00066
      FLMODE(I)=SQRT(UU(I)**2+VV(I)**2)                                      LAM00067
      DMODE(I)=-UU(I)/FLMODE(I)                                              LAM00068
      THLFDB(I)=.69315/ABS(UU(I))                                            LAM00069
      GO TO 60                                                               LAM00070
   50 IZERON(I)=1                                                            LAM00071
   60 CONTINUE                                                               LAM00072
      DO 110 I=1,NUMRTS                                                      LAM00073
      IF(IZERON(I).NE.0) GO TO 110                                           LAM00074
      RELP=UU(I)*SLOT(1,2) +SLOT(1,3)                                        LAM00075
      ZPRT=VV(I)*SLOT(1,2)                                                   LAM00076
      ROOOT(1,1)=CMPLX(RELP,ZPRT)                                            LAM00077
      ROOOT(1,2)=CMPLX(SLOT(1,9),.0)                                         LAM00078
      RELP= -( UU(I)*SLOT(1,5) +SLOT(1,6)          )                         LAM00079
      ZPRT= -VV(I)*SLOT(1,5)                                                 LAM00080
      ROOOT(1,3)=CMPLX(RELP,ZPRT)                                            LAM00081
      ROOOT(2,1)= CMPLX(SLOT(2,3),.0)                                        LAM00082
      RELP = UU(I)*SLOT(2,8) +SLOT(2,9)                                      LAM00083
      ZPRT = VV(I)*SLOT(2,8)                                                 LAM00084
      ROOOT(2,2)=CMPLX(RELP,ZPRT)                                            LAM00085
      RELP =-((UU(I)**2 -VV(I)**2)*SLOT(2,4) +UU(I)*SLOT(2,5))               LAM00086
      ZPRT =-( 2.*UU(I)*VV(I)*SLOT(2,4) +VV(I)*SLOT(2,5))                    LAM00087
      ROOOT(2,3)=CMPLX(RELP,ZPRT)                                            LAM00088
      CALL COMSOL (ROOOT,RPRT1,ZPT1,RPRT2,ZPT2)                              LAM00089
      ZLNT1(I)=SQRT( RPRT1*RPRT1+ZPT1*ZPT1)                                  LAM00090
      IF(RPRT1.EQ..0) GO TO 70                                               LAM00091
      FANG1(I)=57.3*ATAN2(ZPT1,RPRT1)                                        LAM00092
      GO TO 80                                                               LAM00093
   70 FANG1(I)=90.                                                           LAM00094
   80 ZLNT2(I)=   SQRT((RPRT2*UU(I)+ZPT2*VV(I))**2 +(ZPT2*UU(I)-RPRT2*      LAM00095
     1VV(I))**2)/(UU(I)**2+VV(I)**2)                                         LAM00096
      IF(RPRT2.EQ..0) GO TO 90                                               LAM00097
      FANG2(I)=57.3*ATAN2((ZPT2*UU(I)-RPRT2*VV(I)),(RPRT2*UU(I)+ZPT2*VV(LAM00098
     1I)))                                                                   LAM00099
      GO TO 100                                                              LAM00100
   90 FANG2(I)=90.                                                           LAM00101
  100 CONTINUE                                                               LAM00102
  110 CONTINUE                                                               LAM00103
      DO 120 I=1,NUMRTS                                                      LAM00104
      IF(VV(I).LT..0) GO TO 120                                              LAM00105
      IF(IZERON(I).NE.0) GO TO 120                                           LAM00106
      WRITE(6,140)UU(I),VV(I),PLMODE(I),FLMODE(I),DMODE(I),THLFDB(I)         LAM00107
  120 CONTINUE                                                               LAM00108
      I=1                                                                    LAM00109
      CALL MODE (PD,V,I)                                                     LAM00110
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      RETURN                                                            LAM00111
  130 FORMAT(1H0,55X,20HCONTROLS FIXED ROOTS/25X,4HREAL,8X,5HIMAG.,     LAM00112
     1     8X,6HPERIOD,5X,9HNAT.FREQ.,5X,7HDAMPING,5X,10HT*HALF-DBL)    LAM00113
  140 FORMAT(21X,6G13.5)                                                LAM00114
  150 FORMAT(1H1,60X,12HLATERAL MODE)                                   LAM00115
  160 FORMAT(1H0,48X,40HCOEFFICIENTS OF CHARACTERISTIC EQUATIONS/       LAM00116
     1     11X,17HBETA-S**2  BETA-S,6X,4HBETA,9X,17HPHI-S**2    PHI-S,LAM00117
     2     9X,3HPHI,8X,6HR-S**2,6X,3HR-S,11X,1HR)                     LAM00118
  170 FORMAT(1H0,10X,9G12.5)                                            LAM00119
      END                                                               LAM00120

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      SUBROUTINE LIFJET                                                 LIFJ0001
      COMMON /FORCE/  T1(8),XFLJ,T2(9),YFLJ,T3(12),ZFLJ,T4(11),RMLJ,    LIFJ0002
     1                T5(2),RGYRO,T6(9),PMLJ,T7(2),PGYRO,T8(9),YMLJ,    LIFJ0003
     2                T9(2),YGYRO                                       LIFJ0004
      COMMON /MANARO/ T10(15),APD,T11,ARD,AYD,T12(7),TLSTK(2),THLSTK(2),LIFJ0005
     1                T13(7),FAIL(6)                                    LIFJ0006
      COMMON /LJETS/  NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APBJTL(6),    LIFJ0007
     1                ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2)      LIFJ0008
     2               ,AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6)       LIFJ0009
     3               ,ANGA(6),ANGB(6),TLJET(6),ANGC(6),THLJET(6)        LIFJ0010
     4              ,TL(2,6),NLINK,DPBJTL(6)                           LIFJ0011
      DIMENSION ANG1(6)                                                 LIFJ0012
      YL(X,A,B,C,D,E,F)=(D/A)*AMIN1(AMAX1(X,0.),A)+(E-D)/(B-A)*         LIFJ0013
     1      AMIN1(AMAX1((X-A),0.),(B-A))+(F-E)/(C-B)*AMIN1(AMAX1((X-B)  LIFJ0014
     2      ,0.),(C-B))                                                 LIFJ0015
      XFLJ=0.                                                           LIFJ0016
      YFLJ=0.                                                           LIFJ0017
      ZFLJ=0.                                                           LIFJ0018
      RMLJ=0.                                                           LIFJ0019
      PMLJ=0.                                                           LIFJ0020
      YMLJ=0.                                                           LIFJ0021
      RGYRO=0.                                                          LIFJ0022
      PGYRO=0.                                                          LIFJ0023
      YGYRO=0.                                                          LIFJ0024
      DO 10 J=1,6                                                       LIFJ0025
      ANG1(J)=0.                                                        LIFJ0026
      DPBJTL(J)=0.                                                      LIFJ0027
      TLJET(J)=0.                                                       LIFJ0028
   10 THLJET(J)=0.                                                      LIFJ0029
      DO 40 J=1,NJETL                                                   LIFJ0030
      J1=NCONL(J)                                                       LIFJ0031
      IF(J1.LT.1.OR.J1.GT.2) GO TO 40                                   LIFJ0032
      XLT(J1)=TLSTK(J1)*CONLJ(J1,1)/100.                                LIFJ0033
      XLTH(J1)=THLSTK(J1)*CONLJ(J1,2)/100.                              LIFJ0034
      TLJET(J)=CONLJ(J1,3)*XLT(J1)*FAIL(J)                              LIFJ0035
      IF(NLINK.NE.0) GOTO 20                                            LIFJ0036
      DPBJTL(J)=CONLJ(J1,4)*XLT(J1)+CONLJ(J1,5)*XLTH(J1)                LIFJ0037
      GOTO 30                                                           LIFJ0038
   20 DPBJTL(J)=YL(XLTH(J1),TL(J1,1),TL(J1,3),TL(J1,5),                 LIFJ0039
     1               TL(J1,2),TL(J1,4),TL(J1,6))                        LIFJ0040
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 30 DPHJTL(J)=DPHJTL(J)/57.2957795                                          LIFJ0041
    THLJET(J)=DPHJTL(J)+APHJTL(J)                                           LIFJ0042
    ANGL(J)=ANG(J)*(ANGA(J)+ANGB(J)*TLJET(J)+ANGC(J)*TLJET(J)**2)           LIFJ0043
    ANGL(J)=ANGL(J)*FAIL(J)                                                 LIFJ0044
 40 CONTINUE                                                                LIFJ0045
    DO 70 J=1,NJETL                                                         LIFJ0046
    TV1=-THLJET(J)                                                          LIFJ0047
    TV2=-APHJTL(J)                                                          LIFJ0048
    IF(ATT(J).EQ.0.) GO TO 50                                               LIFJ0049
    TV1=THLJET(J)                                                           LIFJ0050
    TV2=APHJTL(J)                                                           LIFJ0051
    CALL VR3D (0.,0.,-TLJET(J),TV2,TV1,0.,XF,YF,ZF,1)                       LIFJ0052
    GO TO 60                                                                LIFJ0053
 50 CONTINUE                                                                LIFJ0054
    CALL VR3D (0.,0.,-TLJET(J),0.,TV1,TV2,XF,YF,ZF,-1)                      LIFJ0055
 60 CONTINUE                                                                LIFJ0056
    CALL XPRO (XAJETL(J),YAJETL(J),ZAJETL(J),XF,YF,ZF,RM,PM,YM)             LIFJ0057
    XFLJ=XFLJ+XF                                                            LIFJ0058
    YFLJ=YFLJ+YF                                                            LIFJ0059
    ZFLJ=ZFLJ+ZF                                                            LIFJ0060
    RMLJ=RMLJ+RM                                                            LIFJ0061
    PMLJ=PMLJ+PM                                                            LIFJ0062
    YMLJ=YMLJ+YM                                                            LIFJ0063
    CALL VR3D (ANGL(J),0.,0.,PSIANG(J),THEANG(J),0.,XANG,YANG,ZANG,1)       LIFJ0064
    CALL XPRO (ARO,APO,AYO,XANG,YANG,ZANG,RG,PG,YG)                         LIFJ0065
    RGYRO=RGYRO-RG                                                          LIFJ0066
    PGYRO=PGYRO-PG                                                          LIFJ0067
    YGYRO=YGYRO-YG                                                          LIFJ0068
 70 CONTINUE                                                                LIFJ0069
    RETURN                                                                  LIFJ0070
    END                                                                     LIFJ0071
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      SUBROUTINE LMODE (V,QWG,XFW,ZFW,CWING,XAELE)                          LMOD0001
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,           LMOD0002
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RHO,R12,SPD(6,6,1),       LMOD0003
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),        LMOD0004
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,        LMOD0005
     4               XDAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),      LMOD0006
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),    LMOD0007
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)   LMOD0008
     7               ,XLJT(84),YLJT(7)                                     LMOD0009
      COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,       LMOD0010
     1                PILGH2,PWGELI                                        LMOD0011
      COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,            LMOD0012
     1                INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)               LMOD0013
      COMMON /MANAL/ Q,ALFA                                                 LMOD0014
      DIMENSION PLMODE(6),FLMODE(6),THLFDB(6),IZERON(6),SM(3,9),DMODE(6)    LMOD0015
     1      ,FANG2(6),ROOOT(2,3),       ZLNT1(6),FANG1(6),ZLNT2(6)         LMOD0016
      REAL IY,MASS                                                          LMOD0017
      COMPLEX ROOOT                                                         LMOD0018
      WRITE ( 6,150)                                                        LMOD0019
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      S1=SIN(ALFA)                                                          LMOD0020
      C1=COS(ALFA)                                                          LMOD0021
      S2=S1**2                                                              LMOD0022
      C2=C1**2                                                              LMOD0023
      S1C1=S1*C1                                                            LMOD0024
      DO 10 I=1,4                                                           LMOD0025
      PLMODE(I)=.0                                                          LMOD0026
      FLMODE(I)=.0                                                          LMOD0027
      THLFDB(I)=.0                                                          LMOD0028
      IZERON(I)=0                                                           LMOD0029
   10 CONTINUE                                                              LMOD0030
      DO 20 I=1,3                                                           LMOD0031
      DO 20 J=1,9                                                           LMOD0032
      SLOT(I,J)=.0                                                          LMOD0033
   20 CONTINUE                                                              LMOD0034
      SLOT(1,2) = MASS                                                      LMOD0035
      SLOT(1,3)=-(SPD(1,1,1)*C2+(SPD(2,1,1)+SPD(1,2,1))*S1C1                LMOD0036
     1      +SPD(2,2,1)*S2)                                                 LMOD0037
      SLOT(1,6)=-(SPD(2,1,1)*C2-(SPD(1,1,1)-SPD(2,2,1))*S1C1                LMOD0038
     1      -SPD(1,2,1)*S2)                                                 LMOD0039
      SLOT(1,8)=-(SPD(3,1,1)*C1+SPD(3,2,1)*S1)/V                            LMOD0040
      SLOT(1,9)=ZFW/V                                                       LMOD0041
      SLOT(2,3)=-(SPD(1,2,1)*C2+(SPD(2,2,1)-SPD(1,1,1))*S1C1                LMOD0042
     1      -SPD(2,1,1)*S2)                                                 LMOD0043
      CZADE=YEL(17)*QELE*XAELE*YWG(17)*PWGEL1*YWG(18)*YEL(18)*DTRRSQ/       LMOD0044
     1      ((3.+YWG(18))*(3.+YEL(18))*(1.-(V*VSND)**2))                    LMOD0045
      SLOT(2,5)=MASS-CZADE                                                  LMOD0046
      SLOT(2,6)=-(SPD(2,2,1)*C2-(SPD(1,2,1)+SPD(2,1,1))*S1C1                LMOD0047
     1      +SPD(1,1,1)*S2)                                                 LMOD0048
      SLOT(2,8)=-(MASS*(SPD(3,2,1)*C1-SPD(3,1,1)*S1)/V)                     LMOD0049
      SLOT(2,9)=-XFW/V                                                      LMOD0050
      SLOT(3,3)=-(SPD(1,3,1)*C1+SPD(2,3,1)*S1)                              LMOD0051
      SLOT(3,5)=CZADE*XAELE                                                 LMOD0052
      SLOT(3,6)=-(SPD(2,3,1)*C1-SPD(1,3,1)*S1)                              LMOD0053
      SLOT(3,7)=IY/V                                                        LMOD0054
      SLOT(3,8)=-SPD(3,3,1)/V                                               LMOD0055
      DO 30 I=1,3                                                           LMOD0056
      X1=14.5939                                                            LMOD0057
      IF(I.GT.2) X1=4.44822                                                 LMOD0058
      DO 30 J=1,9                                                           LMOD0059
   30 SM(I,J)=SLOT(I,J)*X1                                                  LMOD0060
      WRITE (6,160)                                                         LMOD0061
      WRITE(6,170)((SM(I,J),J=1,9),I=1,3)                                   LMOD0062
      WRITE(6,130)                                                          LMOD0063
      CALL SRT                                                              LMOD0064
      INDEX=6                                                               LMOD0065
      CALL ELEC (GAINB)                                                     LMOD0066
      DO 60 I=1,NUMRTS                                                      LMOD0067
      IF(UU(I).EQ..0.AND.VV(I).EQ..0) GO TO 50                              LMOD0068
      IF(VV(I).EQ..0)GO TO 40                                               LMOD0069
      PLMODE(I)=6.2832/ABS(VV(I))                                           LMOD0070
   40 &F(UU(I).EQ.0.) GO TO 50                                              LMOD0071
      FLMODE(I)=SQRT(UU(I)**2+VV(I)**2)                                     LMOD0072
      DMODE(I)=-UU(I)/FLMODE(I)                                             LMOD0073
      THLFDB(I)=.69315/ABS(UU(I))                                           LMOD0074
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      GO TO 60                                                          LMOD0075
   50 IZERON(I)=1                                                       LMOD0076
   60 CONTINUE                                                          LMOD0077
      DO 110 I=1,NUMRTS                                                 LMOD0078
      IF(IZERON(I).NE.0) GO TO 110                                      LMOD0079
      ROOT(1,1) =CMPLX(SLOT(2,3),.0)                                    LMOD0080
      RELP=UU(I)*SLOT(2,5) +SLOT(2,6)                                   LMOD0081
      ZPRT=VV(I)*SLOT(2,5)                                              LMOD0082
      ROOT(1,2)= CMPLX(RELP,ZPRT)                                       LMOD0083
      RELP=SLOT(2,7)*(VV(I)+UU(I))*(VV(I)-UU(I))-SLOT(2,8)*UU(I)        LMOD0084
     1     -SLOT(2,4)                                                   LMOD0085
      ZPRT=-(2.*UU(I)*VV(I)*SLOT(2,7)+VV(I)*SLOT(2,8))                  LMOD0086
      ROOT(1,3)=CMPLX(RELP,ZPRT)                                        LMOD0087
      ROOT(2,1)=CMPLX(SLOT(3,3),.0)                                     LMOD0088
      RELP=SLOT(3,5)*UU(I)+SLOT(3,6)                                    LMOD0089
      ZPRT=VV(I)*SLOT(3,5)                                              LMOD0090
      ROOT(2,2)=CMPLX(RELP,ZPRT)                                        LMOD0091
      RELP=-(SLOT(3,7)*( UU(I) *UU(I) -VV(I)*VV(I)) +SLOT(3,8)*UU(I))   LMOD0092
      ZPRT=-(SLOT(3,7)*2.* UU(I) *VV(I) +SLOT(3,8)*VV(I))               LMOD0093
      ROOT(2,3)=CMPLX(RELP,ZPRT)                                        LMOD0094
      CALL COMSOL (ROOT,RPRT1,ZPT1,RPRT2,ZPT2)                          LMOD0095
      ZLNT1(I)=SQRT( RPRT1  **2 + ZPT1  **2)                            LMOD0096
      IF(RPRT1  .EQ..0)GO TO 70                                         LMOD0097
      FANG1(I)=ATAN2(ZPT1,RPRT1)/DTR                                    LMOD0098
      GO TO 80                                                          LMOD0099
   70 FANG1(I)=-90.                                                     LMOD0100
   80 ZLNT2(I)= SQRT(RPRT2**2 +ZPT2**2)                                 LMOD0101
      IF(RPRT2.EQ..0)GO TO 90                                           LMOD0102
      FANG2(I)=ATAN2(ZPT2,RPRT2)/DTR                                    LMOD0103
      GO TO 100                                                         LMOD0104
   90 FANG2(I)=FANG1(I)+90.                                             LMOD0105
  100 CONTINUE                                                          LMOD0106
  110 CONTINUE                                                          LMOD0107
      DO 120 I=1,NUMRTS                                                 LMOD0108
      IF(VV(I).LT..0) GO TO 120                                         LMOD0109
      IF(IZERON(I).NE.0)GO TO 120                                       LMOD0110
      WRITE(6,140) UU(I),VV(I),PLMODE(I),FLMODE(I),DMODE(I),THLFDB(I)   LMOD0111
  120 CONTINUE                                                          LMOD0112
      I=2                                                               LMOD0113
      CALL MODE (PD,V,I)                                                LMOD0114
      RETURN                                                            LMOD0115
  130 FORMAT(1H0,55X,20HCONTROLS FIXED ROOTS/25X,4HREAL,8X,5HIMAG.,     LMOD0116
     1     8X,6HPERIOD,5X,9HNAT.FREQ.,5X,7HDAMPING,5X,10HT*HALF-DBL)    LMOD0117
  140 FORMAT(21X,6G13.5)                                                LMOD0118
  150 FORMAT(1H1,57X,17HLONGITUDINAL MODE)                              LMOD0119
  160 FORMAT(1H0,48X,40HCOEFFICIENTS OF CHARACTERISTIC EQUATIONS/       LMOD0120
     1     13X,14HU-S**2      U-S,11X,1HU,6X,21HALPHA-S**2     ALPHA-S,LMOD0121
     2     6X,29HALPHA     THETA-S**2    THETA-S,7X,5HTHETA)           LMOD0122
  170 FORMAT(1H0,10X,9G12.5)                                            LMOD0123
      END                                                               LMOD0124
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      SUBROUTINE MANU                                                   MANU0001
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      COMMON /FORCE/  XF,T1(12),YF,T2(9),ZF,T3(11),                          MANU0002
     1                QL,T4(12),QM,T5(12),QN                                 MANU0003
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,         MANU0004
     1                T6(12),DIST,T7(23),TIME,TMAX,T8(120),ALGEZ,T9(4),      MANU0005
     2                DIXIZ,DIYIX,DIZIY,T10(3),TSTAR(14),ZMAX2,ZMAX3,        MANU0006
     3                T11(3),ZDELT1,ZDELT2                                   MANU0007
      COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARRG,ASEP,AYBG,CGBL,DPIX,DPIZ,      MANU0008
     1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,RMASS,        MANU0009
     2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R,      MANU0010
     3                P01DTR,RDELT1,RDELT2                                   MANU0011
      COMMON /MANAL/  T12(9),ALCYP,T13(31),ALECR1,ALGFPD                     MANU0012
      COMMON /POMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR                       MANU0013
      COMMON /MANARO/ I,V,NWAG,TDELT,T14(9),VXB,VZB,APD,VYB,ARD,AYD,         MANU0014
     1                T15(4),AYE,APE,ARE                                     MANU0015
      COMMON /TOPLOT/ T16(6),EXIT,ICOM(20),IPSN,T17(5),NVARS                 MANU0016
      COMMON /FORY/   Y(4,150)                                               MANU0017
      COMMON /STANRO/ J,W,LINK                                               MANU0018
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)      MANU0019
      REAL LP,NP,IXZ                                                         MANU0020
      DIMENSION A(209)                                                       MANU0021
      EQUIVALENCE (A(1),Y(1,1))                                              MANU0022
      XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3))                                MANU0023
C                                                                            MANU0024
C          PART 3.     SIX DEGREE OF FREEDOM MANEUVER SECTION              MANU0025
C                                                                            MANU0026
C                      SYMBOL IDENTIFICATION                                 MANU0027
C                                                                            MANU0028
C     Y(1, 1)  VXB      VELOCITY          X-COMPONENT      BODY REFERENCE   MANU0029
C     Y(1, 2)  VYB      VELOCITY          Y-COMPONENT      BODY REFERENCE   MANU0030
C     Y(1, 3)  VZB      VELOCITY          Z-COMPONENT      BODY REFERENCE   MANU0031
C     Y(1, 4)  AYD      VELOCITY        YAW-COMPONENT      BODY REFERENCE   MANU0032
C     Y(1, 5)  APD      VELOCITY      PITCH-COMPONENT      BODY REFERENCE   MANU0033
C     Y(1, 6)  ARD      VELOCITY       ROLL-COMPONENT      BODY REFERENCE   MANU0034
C     Y(1,10)  AYE      EULER ANGLE     YAW-COMPONENT      FIXED TO BODY    MANU0035
C     Y(1,11)  APE      EULER ANGLE   PITCH-COMPONENT      FIXED TO BODY    MANU0036
C     Y(1,12)  ARE      EULER ANGLE    ROLL-COMPONENT      FIXED TO BODY    MANU0037
C     Y(1,15)  XX       DISPLACEMENT      X-COMPONENT      FIXED REFERENCE  MANU0038
C     Y(1,16)  YY       DISPLACEMENT      Y-COMPONENT      FIXED REFERENCE  MANU0039
C     Y(1,17)  ZZ       DISPLACEMENT      Z-COMPONENT      FIXED REFERENCE  MANU0040
C     Y(1,76)  VXBD     ACCELERATION      X-COMPONENT      BODY REFERENCE   MANU0041
C     Y(1,77)  VYBD     ACCELERATION      Y-COMPONENT      BODY REFERENCE   MANU0042
C     Y(1,78)  VZBD     ACCELERATION      Z-COMPONENT      BODY REFERENCE   MANU0043
C     Y(1,79)  AYDD     ACCELERATION    YAW-COMPONENT      BODY REFERENCE   MANU0044
C     Y(1,80)  APDD     ACCELERATION  PITCH-COMPONENT      BODY REFERENCE   MANU0045
C     Y(1,81)  ARDD     ACCELERATION   ROLL-COMPONENT      BODY REFERENCE   MANU0046
C     Y(1,85)  AYED     EUL.ANG.VEL.    YAW-COMPONENT      FIXED TO BODY    MANU0047
C     Y(1,86)  APED     EUL.ANG.VEL.  PITCH-COMPONENT      FIXED TO BODY    MANU0048
C     Y(1,87)  ARED     EUL.ANG.VEL.   ROLL-COMPONENT      FIXED TO BODY    MANU0049
C     Y(1,90)  XXD      VELOCITY          X-COMPONENT      FIXED REFERENCE  MANU0050
C     Y(1,91)  YYD      VELOCITY          Y-COMPONENT      FIXED REFERENCE  MANU0051
C     Y(1,92)  ZZD      VELOCITY          Z-COMPONENT      FIXED REFERENCE  MANU0052
C                                                                            MANU0053
      IF(NVARS.NE.0) GO TO 20                                                MANU0054
      I=1                                                                    MANU0055
      IND=0                                                                  MANU0056
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      LINK=4                                                          MANU0057
   10 HDELT=.5*TDELT                                                  MANU0058
      RDELT1=1./TDELT                                                 MANU0059
      RDELT2=2.*RDELT1                                                MANU0060
      IF(KTCTR.EQ.0) GO TO 50                                         MANU0061
   20 CONTINUE                                                        MANU0062
      NVARS=0                                                         MANU0063
      IF(TIME.LT.TMAX) GO TO 60                                       MANU0064
      KTCTR=KTCTR+1                                                   MANU0065
      GO TO (30,40,170), KTCTR                                        MANU0066
   30 TDELT=ZDELT2                                                    MANU0067
      TMAX=ZMAX2                                                      MANU0068
      GO TO 10                                                        MANU0069
   40 TDELT=ZDELT1                                                    MANU0070
      TMAX=ZMAX3                                                      MANU0071
      GO TO 10                                                        MANU0072
C     ****      ****    TIME LOOP    ****      ****                   MANU0073
C                       **** ****                                     MANU0074
   50 CONTINUE                                                        MANU0075
      A1Y=AY                                                          MANU0076
      ZFLWG1=ZFLWG                                                    MANU0077
      ZFRWG1=ZFRWG                                                    MANU0078
      IF(ISTOP.NE.1) ISTOP=0                                          MANU0079
      CALL INIT                                                       MANU0080
      TIME=TIME+TDELT                                                 MANU0081
      DIST=DIST+V*TDELT                                               MANU0082
      IF(TSTAB(1).GT.TIME) GO TO 20                                   MANU0083
      NVARS=1                                                         MANU0084
      I=1                                                             MANU0085
      GO TO 120                                                       MANU0086
C              ***RUNGE-KUTTA***                                      MANU0087
   60 I=2                                                             MANU0088
   70 GO TO (170,80,100,90),I                                         MANU0089
   80 DELT2=HDELT                                                     9 MANU0090
      DELT2R=RDELT2                                                   MANU0091
      QUAD1=RDELT1                                                    MANU0092
      GO TO 100                                                       MANU0093
   90 DELT2=TDELT                                                     MANU0094
      DELT2R=RDELT1                                                   MANU0095
      QUAD1=RDELT2                                                    MANU0096
  100 DO 110 K=1,75                                                   MANU0097
      Y(I,K)=Y(1,K)+Y(I-1,K+75)*DELT2                                 MANU0098
  110 CONTINUE                                                        MANU0099
  120 VXB=Y(I,1)                                                      MANU0100
      VYB=Y(I,2)                                                      MANU0101
      VZB=Y(I,3)                                                      MANU0102
      AYD=Y(I,4)                                                      MANU0103
      APD=Y(I,5)                                                      MANU0104
      ARD=Y(I,6)                                                      MANU0105
      AYE=Y(I,10)                                                     MANU0106
      APE=Y(I,11)                                                     MANU0107
      ARE=Y(I,12)                                                     MANU0108
      XX=Y(I,15)                                                      MANU0109
      YY=Y(I,16)                                                      MANU0110
      ZZ=Y(I,17)                                                      MANU0111
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      CALL VR3D(VXB,VYB,VZB,AYE,APE,ARE,XXD,YYD,ZZD,1)                  MANU0112
      VHSQ=XXD**2+YYD**2                                                MANU0113
      VH=SQRT(VHSQ)                                                     MANU0114
      V=SQRT(VHSQ+ZZD**2)                                               MANU0115
      AY=0.                                                             MANU0116
      AYFP=0.                                                           MANU0117
      APFP=0.                                                 9         MANU0118
      TV1=YGUST-VYB                                                     MANU0119
      TV2=VXB-XGUST                                                     MANU0120
      IF((TV1**2+TV2**2).NE.0.) AY=ATAN2(TV1,TV2)                       MANU0121
      IF(VH.NE.0.) AYFP=ATAN2(YYD,XXD)                                  MANU0122
      IF(V.NE.0.) APFP=ATAN2(-ZZD,VH)                                   MANU0123
      IF(NVARS.NE.0) RETURN                                             MANU0124
      IF(I.EQ.3.OR.IND.EQ.1) GO TO 130                                  MANU0125
C               *** VARIATIONS DUE TO INPUTS ***                        MANU0126
      ADISP(1)=AYE*DTRR                                                 MANU0127
      ADISP(2)=APE*DTRR                                                 MANU0128
      ADISP(3)=ARE*DTRR                                                 MANU0129
      ARATE(1)=AYD*DTRR                                                 MANU0130
      ARATE(2)=APD*DTRR                                                 MANU0131
      ARATE(3)=ARD*DTRR                                                 MANU0132
      CALL VARI                                                         MANU0133
      IF(EXIT.NE.0.) GO TO 170                                          MANU0134
      CALL CONTRL(2)                                                    MANU0135
      DELALE=DELTA(1)*XSYS(1)                                           MANU0136
      ALECR1=ALGEZ+DELALE                                               MANU0137
      DELAIL=DELTA(2)*XSYS(2)                                           MANU0138
      ALCYP=DELAIL                                                      MANU0139
      DELRUD=DELTA(3)*XSYS(3)                                           MANU0140
      ALGFPD=ALGF+DELRUD                                                MANU0141
  130 CALL ANAL                                                         MANU0142
      IF(EXIT.NE.0.) GO TO 170                                          MANU0143
      LP=QL-APD*(AYD*DIZIY-ARD*IXZ)                                     MANU0144
      NP=QN-APD*(ARD*DIYIX+AYD*IXZ)                                     MANU0145
      Y(I,76)= XF*RMASS- APD*VZB + AYD*VYB                              MANU0146
      Y(I,77)= YF*RMASS- AYD*VXB + ARD*VZB                              MANU0147
      Y(I,78)= ZF*RMASS- ARD*VYB + APD*VXB                              MANU0148
      AYDD=LP*DPIXZ+NP*DPIX                                             MANU0149
      APDD=(QM-AYD*ARD*DIXIZ+(AYD+ARD)*(AYD-ARD)*IXZ)*RIY               MANU0150
      ARDD=LP*DPIZ+NP*DPIXZ                                             MANU0151
      Y(I,79)=AYDD                                                      MANU0152
      Y(I,80)=APDD                                                      MANU0153
      Y(I,81)=ARDD                                                      MANU0154
      CAPE=COS(APE)                                                     MANU0155
      SAPE=SIN(APE)                                                     MANU0156
      CARE=COS(ARE)                                                     MANU0157
      IF(ABS(CAPE).LT.0.001) GO TO 170                                  MANU0158
      Y(I,85)= (APD*SARE + AYD*CARE)/CAPE                               MANU0159
      Y(I,86)= APD*CARE - AYD*SARE                                      MANU0160
      Y(I,87)=APD+Y(I,85)*SIN(APE)                                      MANU0161
      Y(I,90)= XXD                                                      MANU0162
      Y(I,91)= YYD                                                      MANU0163
      Y(I,92)= ZZD                                                      MANU0164
      IF(IND.NE.0) GO TO 150                                            MANU0165
      I=I+1                                                             MANU0166
```

```
      IF(I.LE.4) GO TO 70                                                    MANU0167
      DO 140 I=1,75                                                          MANU0168
      K=I+75                                                                 MANU0169
      Y(4,K)=(Y(1,K)+2.*(Y(2,K)+Y(3,K))+Y(4,K))*.1666667                     MANU0170
  140 Y(4,I)=Y(1,I)+TDELT*Y(4,K)                                             MANU0171
      IND=1                                                                  MANU0172
      I=4                                                                    MANU0173
      GO TO 120                                                              MANU0174
  150 DO 160 I=1,150                                                         MANU0175
  160 Y(1,I)=Y(4,I)                                                          MANU0176
      T=T+TDELT                                                              MANU0177
      IND=0                                                                  MANU0178
      I=1                                                                    MANU0179
      GO TO 50                                                               MANU0180
  170 A4=99999999.                                                           MANU0181
      WRITE (3) IPSN,A4,A                                                    MANU0182
      RETURN                                                                 MANU0183
      END                                                                    MANU0184
```

```
      SUBROUTINE MATRIX (A1,A2,A3,A,N1)                                      MATR0001
      DIMENSION A(9)                                                         MATR0002
C         COMPUTE EULER ANGLE MATRIX A FROM EULER ANGLES A1,A2,A3            MATR0003
C         N1=1 IS FOR USUAL MATRIX                                           MATR0004
C         N1=-1 IS FOR INVERSE OF USUAL MATRIX                               MATR0005
      SA1=SIN(A1)                                                            MATR0006
      SA2=SIN(A2)                                                            MATR0007
      SA3=SIN(A3)                                                            MATR0008
      CA1=COS(A1)                                                            MATR0009
      CA2=COS(A2)                                                            MATR0010
      CA3=COS(A3)                                                            MATR0011
      S1C3=SA1*CA3                                                           MATR0012
      S1S3=SA1*SA3                                                           MATR0013
      C1C3=CA1*CA3                                                           MATR0014
      C1S3=CA1*SA3                                                           MATR0015
      A(1)=CA1*CA2                                                           MATR0016
      A(3-N1)=C1S3*SA2-S1C3                                                  MATR0017
      A(5-2*N1)=C1C3*SA2+S1S3                                                MATR0018
      A(3+N1)=SA1*CA2                                                        MATR0019
      A(5)=S1S3*SA2+C1C3                                                     MATR0020
      A(7+N1)=CA2*SA3                                                        MATR0021
      A(5+2*N1)=-SA2                                                         MATR0022
      A(7-N1)=S1C3*SA2-C1S3                                                  MATR0023
      A(9)=CA2*CA3                                                           MATR0024
      RETURN                                                                 MATR0025
      END                                                                    MATR0026
```

```
      SUBROUTINE MNEM                                                        MNEM0001
```

```
 COMMON /FORCE/  XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,          MNEM0002
1                XFLJ,XFGUN,XFFIN,XFW,XADD,                             MNEM0003
2                YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW,      MNEM0004
0                YADD,                                                  MNEM0005
3                ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,         MNEM0006
4                ZFLJ,ZFGUN,ZFW,ZADD,                                   MNEM0007
5                QL,QRWG,QLWG,QELE,QFUS,QRJET,QLJET,QRMJ,QRMLJ,QGUN,    MNEM0008
A                QFIN,QGYRO,QMADD,                                      MNEM0009
6                QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN,     MNEM0010
8                MFIN,PGYRO,PMADD,                                      MNEM0011
7                QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN,     MNEM0012
C                NFIN,YGYRO,YMADD                                       MNEM0013
 COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,            MNEM0014
1                PD(6,7),DTR,EPD,ERR(6),RM1,RM0,R12,SPD(6,6,1),         MNEM0015
2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),          MNEM0016
3                XIT(21),XWG(21),YWG(21),YFL(21),YFN(21),RLCG,          MNEM0017
4                DAMP,DEPD(11),EPUS,EPDX(11),MASS,WLCG,XCON(63),        MNEM0018
5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),      MNEM0019
6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)     MNEM0020
7               ,XLJT(84),YLJT(7)                                       MNEM0021
 COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,         MNEM0022
1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),         MNEM0023
2                TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,          MNEM0024
3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,             MNEM0025
4                TSTAB(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,            MNEM0026
5                ZDELT1,ZDELT2                                          MNEM0027
 COMMON /STAMAN/ XX,YY,AY1,RIY,APBG,ARBG,ASEP,AYBG,CGBL,DPIX,DPIZ,      MNEM0028
1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,RMASS,        MNEM0029
2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R,      MNEM0030
3                P01DTR,RDELT1,RDELT2                                   MNEM0031
 COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,          MNEM0032
1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,       MNEM0033
2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,       MNEM0034
3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,       MNEM0035
4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,           MNEM0036
5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1              MNEM0037
 COMMON /ROMAN/  PI,77,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,           MNEM0038
1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,         MNEM0039
2                LNGTH1,PILGH1,START2                                   MNEM0040
 COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,     MNEM0041
1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD,        MNEM0042
2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE                 MNEM0043
 COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,        MNEM0044
1                PILGH2,PWGEL1                                          MNEM0045
 COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLBO,CNBO,ETAQ,NJET,      MNEM0046
1                QFIN,CLBCL,YFS(14),CNBCL,CNPCL,CNRCD,CNRCL,COLKS,      MNEM0047
2                D3ELE,FNSWC,LWING,RPIST,YAERO(31,3),APBJET,ARBJET,     MNEM0048
3                AYBJET,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETAQMX,      MNEM0049
4                PWGWK1,RCWING,SWINGH                                   MNEM0050
 COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                        MNEM0051
1                NPART,NVARA,NVARB,NVARC,NSCALE                         MNEM0052
1               ,NVARS,NPRINT,NTIME                                     MNEM0053
 COMMON /FORY/   Y(4,150)                                               MNEM0054
 COMMON /RJETS/  NJETR,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),           MNEM0055
1                TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),             MNEM0056
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     2                AYBJTR(10),APBJTR(10),JTRCON(10)                          MNEM00
      REAL IX,IY,IZ,IXZ,MASS,ITORS,LLJET,LRJET,MLJET,MRJET,NLJET,NRJET          MNEM00
      DIMENSION FOR(74)                                                        MNEM00
      EQUIVALENCE (XF,FOR(1))                                                  MNEM00
      IF(NVARC.NE.2) GO TO 10                                                  MNEM00
      NVARC=0                                                                  MNEM00
      GO TO 20                                                                 MNEM00
   10 CONTINUE                                                                 MNEM00
      IF(NVARC.NE.0) NVARC=1                                                   MNEM00
   20 CONTINUE                                                                 MNEM00
      CALL TINIT                                                               MNEM00
      ALEL=0.                                                                  MNEM00
      ALFIN=0.                                                                 MNEM00
      ALLWG=0.                                                                 MNEM00
      ALRWG=0.                                                                 MNEM00
      APD=0.                                                                   MNEM00
      APDD=0.                                                                  MNEM00
      ARBJET=0.                                                                MNEM00
      ARD=0.                                                                   MNEM00
      ARDD=0.                                                                  MNEM00
      AYD=0.                                                                   MNEM00
      AYDD=0.                                                                  MNEM00
      CDLWG = 0.                                                               MNEM00
      CDRWG = 0.                                                               MNEM00
      CDELE = 0.                                                               MNEM00
      CDFIN = 0.                                                               MNEM00
      CLLWG = 0.                                                               MNEM00
      CLRWG = 0.                                                               MNEM00
      CLELE = 0.                                                               MNEM00
      CLFIN = 0.                                                               MNEM00
      DQL=0.                                                                   MNEM00
      DQN=0.                                                                   MNEM00
      ETAQ=0.                                                                  MNEM00
      EXIT=0.                                                                  MNEM00
      GUSTYP=0.                                                                MNEM00
      HGUSTE=0.                                                                MNEM00
      HGUSTF=0.                                                                MNEM00
      HGUSTW=0.                                                                MNEM00
      IND=1                                                                    MNEM00
      NWAG=0                                                                   MNEM00
      VGUSTE=0.                                                                MNEM00
      VGUSTW=0.                                                                MNEM00
      YGUSTF=0.                                                                MNEM00
      YGUSTW=0.                                                                MNEM01
      XFLJ=0.0                                                                 MNEM01
      YFLJ=0.0                                                                 MNEM01
      ZFLJ=0.0                                                                 MNEM01
      RMLJ=0.0                                                                 MNEM01
      PMLJ=0.0                                                                 MNEM01
      YMLJ=0.0                                                                 MNEM01
      XFRJ=0.0                                                                 MNEM01
      YFRJ=0.0                                                                 MNEM01
      ZFRJ=0.0                                                                 MNEM01
      RMRJ=0.0                                                                 MNEM01
      PMRJ=0.0                                                                 MNEM01
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      YMRJ=0.0                                                          MNEM0112
      XADD=0.                                                           MNEM0113
      YADD=0.                                                           MNEM0114
      ZADD=0.                                                           MNEM0115
      RMADD=0.                                                          MNEM0116
      PMADD=0.                                                          MNEM0117
      YMADD=0.                                                          MNEM0118
      DO 30 I=1,74                                                      MNEM0119
      FOR(I)=0.                                                         MNEM0120
   30 CONTINUE                                                          MNEM0121
      DO 40 J=1,150                                                     MNEM0122
      DO 40 I=1,4                                                       MNEM0123
      Y(I,J)=0.                                                         MNEM0124
   40 CONTINUE                                                          MNEM0125
      DIZIY=IZ-IY                                                       MNEM0126
      DIXIZ=IX-IZ                                                       MNEM0127
      DIYIX=IY-IX                                                       MNEM0128
      IF(XMIN.LT..8726645E-03) XMIN=DTR                                 MNEM0129
      IF(XMIN.GT.DTR) XMIN=DTR                                          MNEM0130
      IF(XLIMIT.LT.(.5*DTR).OR.XLIMIT.GT..1745329) XLIMIT=DTR           MNEM0131
      IF(DAMP.LT.(40.*ERR(1))) DAMP=40.*ERR(1)                          MNEM0132
      YALWG=-YARWG                                                      MNEM0133
      YALJET=-YARJET                                                    MNEM0134
      CALL VR3D (XX0,YYD,ZZD,AYE,APE,ARE,VXB,VYB,VZB,-1)                MNEM0135
      V=SQRT(XX0**2+YYD**2+ZZD**2)                                      MNEM0136
      CALL TURN (XFC,V,ARE)                                             MNEM0137
      RW=1./W                                                           MNEM0138
      MASS=W/32.17                                                      MNEM0139
      IF(EPDS.EQ.0.) EPDS=.5                                            MNEM0140
      ARWING=YWG(18)                                                    MNEM0141
      IF(ARWING.EQ.0.) ARWING=10.                                       MNEM0142
      SWING=SQRT(XWG(1)*ARWING)                                         MNEM0143
      CWING=SWING/ARWING                                                MNEM0144
      RCWING = 0.                                                       MNEM0145
      IF(CWING.NE.0.) RCWING = 1./CWING                                 MNEM0146
      CAGW=COS(AGW)                                                     MNEM0147
      CWG6=.6*CWING                                                     MNEM0148
      YAERO(19,1)=YAERO(3,1)/YAERO(17,1)                                MNEM0149
      DXWGEL=XAWG-XAELE-CWG6*CAGW                                       MNEM0150
      DZWGEL=ZAWG-ZAELE+SIN(AGW)*CWG6                                   MNEM0151
      SWINGH=.5*SWING                                                   MNEM0152
      CNPCD1=CNPCD                                                      MNEM0153
      IF(NJET.EQ.0) COLJET=0.                                           MNEM0154
      CALL VR3D(TAXL,0.,0.,-AYBJET,APBJET,ARBJET,XFLJET,YFLJET,ZFLJET,1)MNEM0155
      CALL XPRO (XAJET,YALJET,ZAJET,XFLJET,YFLJET,ZFLJET,LLJET,MLJET,   MNEM0156
     1    NLJET)                                                        MNEM0157
      CALL VR3D (TAXR,0.,0.,AYBJET,APBJET,ARBJET,XFRJET,YFRJET,ZFRJET,1)MNEM0158
      CALL XPRO (XAJET,YARJET,ZAJET,XFRJET,YFRJET,ZFRJET,LRJET,MRJET,   MNEM0159
     1    NRJET)                                                        MNEM0160
      CYCR1=CYSTK1*CYCF(3)+CYCF(2)                                      MNEM0161
      CYCR2=CYSTK2*CYCL(3)+CYCL(2)                                      MNEM0162
      PED=PEDAL*PEDA(3)+PEDA(2)                                         MNEM0163
      COLKS=COLSTK                                                      MNEM0164
      XSTK(1)=CYCR1*DTRR                                                MNEM0165
      XSTK(2)=CYCR2*DTRR                                                MNEM0166
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      XSTK(3)=PED*PEDA(1)/(PEDA(3)*100.)                                    MNEM0167
      CALL VR3D (XFC(23),XFC(24),XFC(25),AYE,APE,ARE,Y(1,76),Y(1,77),       MNEM0168
     1           Y(1,78),-1)                                                MNEM0169
      Y(1,90)=XXD                                                           MNEM0170
      Y(1,91)=YYD                                                           MNEM0171
      Y(1,92)=ZZD                                                           MNEM0172
      LINK=1                                                                MNEM0173
      IF(NPART.NE.2) GO TO 60                                               MNEM0174
   50 WRITE (6,90) TZERO,ZDELT1,TMAX,ZDELT2,ZMAX2,ZMAX3                     MNEM0175
      CALL IVAH (EXIT,LINK,TAXL,TAXR,PILGH2)                               MNEM0176
   60 CONTINUE                                                              MNEM0177
      Y(1,17)=ZZ                                                            MNEM0178
      IF(NPART.NE.2) RETURN                                                 MNEM0179
C     INITIALIZE VARIABLES ONLY IF A MANEUVER IS CALLED FOR.                 MNEM0180
      LWING=0                                                               MNEM0181
      RMASS=1./MASS                                                         MNEM0182
      RIY=1./IY                                                             MNEM0183
      DP = IX*IZ - IXZ*IXZ                                                  MNEM0184
      IF(DP.EQ.0.) GO TO 70                                                 MNEM0185
      DPIXZ=IXZ/DP                                                          MNEM0186
      DPIX=IX/DP                                                            MNEM0187
      DPIZ=IZ/DP                                                            MNEM0188
      RETURN                                                                MNEM0189
   70 CONTINUE                                                              MNEM0190
      EXIT=1.                                                               MNEM0191
      WRITE (6,80)                                                          MNEM0192
      RETURN                                                                MNEM0193
   80 FORMAT (   109H0 CHECK FUSELAGE INERTIAS. THE NUMBERS INPUT ARE PHYSMNEM0194
     1ICALLY IMPOSSIBLE AND CANNOT BE HANDLED BY THIS PROGRAM.)             MNEM0195
   90 FORMAT (1H0,54X,23HINPUT DATA FOR MANEUVER/35X,   55HSTART     DELTMNEM0196
     1T1       MAX1      DELT2       MAX2       MAX3 /35X,        55H(SEC)MNEM0197
     2  (SEC)      (SEC)      (SEC)      (SEC)      (SEC) /1H,29X,6F10.3   MNEM0198
     3    //35X,       61HJ  XCIT(J,1)     (J,2)      (J,3)      (J,4)     (MNEM0199
     4J,5)      (J,6))                                                     MNEM0200
      END                                                                   MNEM0201
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```
      SUBROUTINE MODE (PD,V,IMODE)                                          MODE0001
      COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,            MODE0002
     1                INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)                MODE0003
      COMMON /KVARTR/ KVAR(6),PDI(6,12)                                     MODE0004
      DIMENSION PD(6,7),SLT(3,9),ISLOT(6,2)                                 MODE0005
      DIMENSION HEAD(6,2),HEAD1(3,2)                                        MODE0006
      DATA HEAD/9HLAT STICK,9HPEDAL,1H ,1H ,1H ,10HLONG STICK,              MODE0007
     1    8HTHROTTLE,9HL THROT 1,9HL THROT 2,9HL ANGLE 1,9HL ANGLE 2/       MODE0008
      DATA HEAD1/                                                           MODE0009
     1   10HSD SLP ANG,10HROLL ANGLE,8HYAW RATE,7HFWD VEL,10HANG OF ATK,    MODE0010
     2   9HPITCH ANG/                                                       MODE0011
      DATA ISLOT /3,4,0,0,0,0,2,1,8,9,10,11/                                MODE0012
      COLD=COELTD                                                           MODE0013
      WRITE (6,30)                                                          MODE0014
      ISLTE=0                                                               MODE0015
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      INDEX=0                                                                  MODE0016
      KSLTT=-2                                                                 MODE0017
      DO 20 I=1,3                                                              MODE0018
      KSLTT=KSLTT+3                                                            MODE0019
      CALL SLTT (SLT,SLOT,KSLTT)                                               MODE0020
      ISLTE=ISLTE+3                                                            MODE0021
      J1=4*IMODE-2                                                             MODE0022
      DO 10 J=1,J1                                                             MODE0023
      JSLTE=ISLOT(J,IMODE)                                                     MODE0024
      CALL SLTE(PD1,ISLTE,JSLTE,IMODE)                                         MODE0025
      COELTD=COELTD/COLD*.3937                                                 MODE0026
      IF(I.EQ.1.AND.IMODE.EQ.2) COELTD=COELTD*V*.3048                          MODE0027
      INDEX=INDEX+1                                                            MODE0028
      WRITE(6,50) HEAD1(I,IMODE),HEAD(J,IMODE),                                MODE0029
     1        (UU(L),VV(L),L=1,3),COELTD                                       MODE0030
   10 CONTINUE                                                                 MODE0031
      CALL SLTT (SLOT,SLT,KSLTT)                                               MODE0032
   20 CONTINUE                                                                 MODE0033
      WRITE(6,40)                                                              MODE0034
      RETURN                                                                   MODE0035
   30 FORMAT(1H0,   57X,15HNUMERATOR ROOTS/1X,117HDEPEND.VAR.      INDEP.MODE0036
     1 VAR.       REAL1          IMAG1          REAL2          IMAG2          MODE0037
     2REAL3          IMAG3       GAIN)                                       MODE0038
   40 FORMAT(/// 34H ALL TIMES ARE IN UNITS OF SECONDS/                       MODE0039
     1 81H ALL GAINS ARE IN UNITS OF M/SEC, RAD OR RAD/SEC PER CM. OF COMODE0040
     2NTROLLER DEFLECTION)                                                    MODE0041
   50 FORMAT(1H ,A10,5X,A10,7G14.6)                                           MODE0042
      END                                                                      MODE0043
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      SUBROUTINE OFFTRM                                                        OFFT0001
      COMMON /STRIAB/ T1(86),DL,DM,DN,DX,DY,DZ,T2(113),XFC(28),                OFFT0002
     1                T3(179),MASS                                            OFFT0003
      COMMON /STRIMA/ T4(3),IXZ,T5(170),DIXIZ,DIYIX,DIZIY                      OFFT0004
      COMMON /MANARO/ I,V,T6(11),VXB,VZB,APD,VYB,ARD,AYD,T7(4),                OFFT0005
     1                AYE,APE,ARE                                             OFFT0006
      COMMON /FORY/   Y(4,150)                                                 OFFT0007
      REAL MASS,IXZ                                                            OFFT0008
      IF(Y(1,85).EQ.0.) GO TO 10                                               OFFT0009
      ARD=-Y(1,85)*SIN(APE)                                                    OFFT0010
      CAPE=Y(1,85)*COS(APE)                                                    OFFT0011
      APD=CAPE*SIN(ARE)                                                        OFFT0012
      AYD=CAPE*COS(ARE)                                                        OFFT0013
      GO TO 20                                                                 OFFT0014
   10 CONTINUE                                                                 OFFT0015
      IF(Y(2,86).EQ.1.) GO TO 20                                               OFFT0016
      APED=32.17*(Y(2,86)-COS(APE)*COS(ARE))/V                                 OFFT0017
      APD=APED                                                                 OFFT0018
   20 CONTINUE                                                                 OFFT0019
      CALL VR3D (XFC(23),XFC(24),XFC(25),AYE,APE,ARE,Y(1,76),Y(1,77),          OFFT0020
     1          Y(1,78),-1)                                                    OFFT0021
      DX  = MASS*(Y(1,76)+APD*VZB-AYD*VYB)                                     OFFT0022
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      DY   = MASS*(Y(1,77)+AYD*VXB-ARD*VZB)                                 OFFT0023
      DZ   = MASS*(Y(1,78)+ARD*VYB-APD*VXB)                                 OFFT0024
      DL   = APD*(AYD*DIZIY-ARD*IXZ)                                        OFFT0025
      DM   = ARD*AYD*DIXIZ+(ARD+AYD)*(ARD-AYD)*IXZ                          OFFT0026
      DN   = APD*(ARD*DIYIX+AYD*IXZ)                                        OFFT0027
   30 CONTINUE                                                              OFFT0028
      RETURN                                                                OFFT0029
      END                                                                   OFFT0030

*****************************************************************************

      SUBROUTINE PARA (W,COND1)                                             PARA0001
      COMMON /STRIAB/ T1(95),PD(6,7),T2(8),KM1,T3(349),NPASS                PARA0002
      COMMON /MANAL/  T4(5),TAXL,TAXR                                       PARA0003
      COMMON /MANARO/ T5(19),COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE,        PARA0004
     1                TLSTK(2),THLSTK(2)                                    PARA0005
      COMMON /TOPLOT/ T6(6),EXIT                                            PARA0006
      DIMENSION VAR(11)                                                     PARA0007
      EQUIVALENCE (VAR(1),COLSTK)                                           PARA0008
      IF(COND1.NE.0.) GO TO 10                                              PARA0009
      CALL WREM                                                             PARA0010
      CALL WRVP (3,VAR,KM1,PD,TAXL,TAXR)                                    PARA0011
   10 IF(EXIT.NE.0.) GO TO 20                                               PARA0012
      WRITE(6,60)                                                           PARA0013
      GO TO 30                                                              PARA0014
   20 WRITE(6,50) NPASS                                                     PARA0015
   30 CONTINUE                                                              PARA0016
      CALL TIMEX (TUSED,DTIME,TLEFT)                                        PARA0017
      WRITE (6,70) NPASS,TUSED                                              PARA0018
   40 RETURN                                                                PARA0019
   50 FORMAT (36H1AIRCRAFT IS ***NOT*** TRIMMED AFTER,I5,                   PARA0020
     1        12H ITERATIONS./13X,9H*********)                             PARA0021
   60 FORMAT (21H-AIRCRAFT IS TRIMMED.)                                     PARA0022
   70 FORMAT (5X6HPART 1,16XI3,12H  ITERATIONS,20XF10.3,                    PARA0023
     1              35H     MINUTES ELAPSED COMPUTING TIME )                PARA0024
      END                                                                   PARA0025

*****************************************************************************

      SUBROUTINE PPLOT                                                      PPL00001
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                       PPL00002
     1                NPART,NVARA,NVARB,NVARC,NSCALE                        PPL00003
     1                ,NVARS,NPRINT,NTIME                                   PPL00004
      COMMON /PLOTD/ HEAD(2,210)                                            PPL00005
      DIMENSION A(209)                                                      PPL00006
      DIMENSION AC(3),AD(3),NVAR(3),RATE(3)                                 PPL00007
      DIMENSION LINE(101)                                                   PPL00008
      EQUIVALENCE (NVAR(1),NVARA)                                           PPL00009
      DATA I1/1H1/,I2/1H2/,I3/1H3/,I4/1H4/,I5/1H5/,I6/1H6/,I7/1H7/,         PPL00010
     1     IB/1H /                                                          PPL00011
C          WRITE HEADING FOR PLOT                                           PPL00012
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```
      CALL WROT                                                          PPL00013
C          CHANGE PROPER PLOT SCALES                                     PPL00014
      IF(NSCALE.LT.4) GO TO 10                                           PPL00015
      NSCALE=NSCALE-4                                                    PPL00016
      AH(3)=AH(3)*1000.                                                  PPL00017
      AL(3)=AL(3)*1000.                                                  PPL00018
   10 IF(NSCALE.LT.2) GO TO 20                                           PPL00019
      NSCALE=NSCALE-2                                                    PPL00020
      AH(2)=AH(2)*1000.                                                  PPL00021
      AL(2)=AL(2)*1000.                                                  PPL00022
   20 IF(NSCALE.LT.1) GO TO 30                                           PPL00023
      NSCALE=NSCALE-1                                                    PPL00024
      AH(1)=AH(1)*1000.                                                  PPL00025
      AL(1)=AL(1)*1000.                                                  PPL00026
   30 DO 60 N=1,3                                                        PPL00027
      L=NVAR(N)                                                          PPL00028
      IF(AH(N).NE.AL(N)) GO TO 40                                        PPL00029
      AL(N)=0.                                                           PPL00030
      AH(N)=10.                                                          PPL00031
   40 CONTINUE                                                           PPL00032
      IF(N.EQ.1) M=I1                                                    PPL00033
      IF(N.EQ.2) M=I2                                                    PPL00034
      IF(N.EQ.3) M=I4                                                    PPL00035
      IF(L.GT.0.AND.L.LT.210) GOTO 50                                    PPL00036
      WRITE(6,180) M,(HEAD(K,210),K=1,2)                                 PPL00037
      AH(N)=-1000.                                                       PPL00038
      AL(N)=-2000.                                                       PPL00039
      GO TO 60                                                           PPL00040
   50 WRITE(6,180) M,(HEAD(K,L),K=1,2)                                   PPL00041
   60 CONTINUE                                                           PPL00042
C          COMPUTE SCALING CONSTANTS                                     PPL00043
      DO 70 I=1,3                                                        PPL00044
      RATE(I)=(AH(I)-AL(I))/10.                                          PPL00045
      AC(I)=10./RATE(I)                                                  PPL00046
   70 AD(I)=1.5-AL(I)*AC(I)                                              PPL00047
C          WRITE SYMBOL AND SCALE HEADING                                PPL00048
      WRITE (6,160) I1, AL(1),AH(1),RATE(1),I3,I1,I2                     PPL00049
      WRITE (6,160) I2, AL(2),AH(2),RATE(2),I5,I1,I4                     PPL00050
      WRITE (6,160) I4, AL(3),AH(3),RATE(3),I6,I2,I4                     PPL00051
      WRITE (6,170) I7,I1,I2,I4                                          PPL00052
C               INITIALIZE LINE TO BLANKS                                PPL00053
      DO 80 I=1,101                                                      PPL00054
   80 LINE(I)=IB                                                         PPL00055
      CALL TIMEX (TUSED,TDELT,TLEFT)                                     PPL00056
   90 READ (3) IPSN,T,A                                                  PPL00057
      IF(T.GT.9999.E+04) GO TO 150                                       PPL00058
      NTIME=NTIME+1                                                      PPL00059
      IF(NTIME.EQ.NPRINT) NTIME=0                                        PPL00060
      IF(NTIME.NE.0) GO TO 90                                            PPL00061
C          SCALE DATA TO FIXED POINT POSITION ON SCALE                   PPL00062
      KB=A(NVARA)*AC(1)+AD(1)                                            PPL00063
      KX=A(NVARB)*AC(2)+AD(2)                                            PPL00064
      KY=A(NVARC)*AC(3)+AD(3)                                            PPL00065
C                         CHECK FOR EQUALITY OF VARIABLES                PPL00066
      IF(KB.EQ.KX) GO TO 100                                             PPL00067
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```
      IF(KB.EQ.KY) GO TO 110                                            PPL00068
      IF(KX.EQ.KY) GO TO 120                                            PPL00069
C                        CHECK TO SEE IF VARIABLES FALL ON SCALE         PPL00070
      IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I1                             PPL00071
      IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I2                             PPL00072
      IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=I4                             PPL00073
      GO TO 140                                                         PPL00074
  100 IF(KB.EQ.KY) GO TO 130                                            PPL00075
C          FIRST AND SECOND VARIABLES ARE IN SAME POSITION              PPL00076
      IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I3                             PPL00077
      IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=I4                             PPL00078
      GO TO 140                                                         PPL00079
C          FIRST AND THIRD VARIABLES ARE IN SAME POSITION               PPL00080
  110 IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I5                             PPL00081
      IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I2                             PPL00082
      GO TO 140                                                         PPL00083
C          SECOND AND THIRD VARIABLES ARE IN SAME POSITION              PPL00084
  120 IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I1                             PPL00085
      IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=I6                             PPL00086
      GO TO 140                                                         PPL00087
C          ALL THREE VARIABLES ARE IN SAME POSITION                     PPL00088
  130 IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=I7                             PPL00089
  140 WRITE (6,190) T,LINE                                              PPL00090
C                    RESET LINE TO BLANKS                               PPL00091
      IF(KB.GE.1.AND.KB.LE.101) LINE(KB)=IB                             PPL00092
      IF(KX.GE.1.AND.KX.LE.101) LINE(KX)=IB                             PPL00093
      IF(KY.GE.1.AND.KY.LE.101) LINE(KY)=IB                             PPL00094
      GO TO 90                                                          PPL00095
  150 CONTINUE                                                          PPL00096
      CALL TIMEX (TUSED,TDELT,TLEFT)                                    PPL00097
      WRITE (6,200) TDELT                                               PPL00098
      RETURN                                                            PPL00099
  160 FORMAT (1H ,10X,9HSCALE    ,A1,8H    FROM,F11.3,4H  TO,F11.3,     PPL00100
     1        10H  1 INCH =,F9.3,12X,A1,5H FOR ,A1,3H + ,A1,4X,         PPL00101
     2        19H ON SAME PRINT POS.)                                   PPL00102
  170 FORMAT (86X,A1,5H FOR ,A1,3H + ,A1,3H + ,A1,19H ON SAME PRINT POS.PPL00103
     1        //67X,6HINCHES,/T20,1H0,T30,1H1,T40,1H2,T50,1H3,T60,1H4,  PPL00104
     2        T70,1H5,T80,1H6,T90,1H7,T100,1H8,T110,1H9,T119,2H10/      PPL00105
     3        T20,1H*,T30,1H*,T40,1H*,T50,1H*,T60,1H*,T70,1H*,T80,1H*,  PPL00106
     4        T90,1H*,T100,1H*,T110,1H*,T120,1H*)                       PPL00107
  180 FORMAT (78X,8H SYMBOL ,A1,2H =,2A10)                              PPL00108
  190 FORMAT (1H ,5X,F9.2,4X,101A1)                                     PPL00109
  200 FORMAT (1H0,F15.5)                                                PPL00110
      END                                                               PPL00111

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      SUBROUTINE RANG (A1,A2,A3,B1,B2,B3,C1,C2,C3,N1,N2)                RANG0001
C                                                                       RANG0002
C       A IS THE MATRIX OF THE A SET OF EULER ANGLES                    RANG0003
C       B IS THE MATRIX OF THE B SET OF EULER ANGLES                    RANG0004
C       C IS THE MATRIX OF THE C SET OF EULER ANGLES                    RANG0005
C                                                                       RANG0006
```

```
C       N1= 1, N2= 1 IS FOR A*A                                          RANG0007
C       N1=-1, N2= 1 IS FOR A*A(TRANSPOSE)                               RANG0008
C       N1= 1, N2=-1 IS FOR A(TRANSPOSE)*A                               RANG0009
C       N1=-1, N2=-1 IS FOR A(TRANSPOSE)*A(TRANSPOSE)                    RANG0010
C                                                                        RANG0011
      DIMENSION A(3,3),B(3,3),C(3,3)                                     RANG0012
C         COMPUTE A AND B MATRICES                                       RANG0013
      CALL MATRIX (A1,A2,A3,A,N1)                                        RANG0014
      CALL MATRIX (B1,B2,B3,B,N2)                                        RANG0015
C         COMPUTE C MATRIX                                               RANG0016
      DO 10 I=1,3                                                        RANG0017
      DO 10 J=1,3                                                        RANG0018
      C(I,J)=0.                                                          RANG0019
      DO 10 L=1,3                                                        RANG0020
      C(I,J)=C(I,J)+B(L,J)*A(I,L)                                        RANG0021
   10 CONTINUE                                                           RANG0022
C         CHECK TO SEE IF PITCH ANGLE IS 90 DEGREES                      RANG0023
      IF(C(1,1).EQ.0..AND.C(1,2).EQ.0.) GO TO 40                         RANG0024
      C1=ATAN2(C(1,2),C(1,1))                                            RANG0025
      C3=ATAN2(C(2,3),C(3,3))                                            RANG0026
      CC3=COS(C3)                                                        RANG0027
      IF(ABS(CC3).LE.0.001) GO TO 20                                     RANG0028
      C2=ATAN2((-C(1,3)*CC3),C(3,3))                                     RANG0029
      GO TO 30                                                           RANG0030
   20 CONTINUE                                                           RANG0031
      C2=ATAN2(-C(1,3),(C(2,3)*SIN(C3)))                                 RANG0032
   30 CONTINUE                                                           RANG0033
C         CHECK TO SEE IF C1,C2,C3 ARE IN WRONG QUADRANT                 RANG0034
      IF(COS(C2).GE.0.) RETURN                                           RANG0035
C         RECOMPUTE C1,C2,C3 IN CORRECT QUADRANT                         RANG0036
      C1=ATAN2(-C(1,2),-C(1,1))                                          RANG0037
      C3=ATAN2(-C(2,3),-C(3,3))                                          RANG0038
      IF(ABS(CC3).LE.0.001) RETURN                                       RANG0039
      C2=ATAN2((-C(1,3)*COS(C3)),C(3,3))                                 RANG0040
      RETURN                                                             RANG0041
C         RESOLVE INDETERMINACY CAUSED BY PITCH ANGLE BY USING OLD       RANG0042
C              YAW ANGLE                                                 RANG0043
   40 CONTINUE                                                           RANG0044
      C2 = -SIGN(1.570796,C(1,3))                                        RANG0045
      C3=(ATAN2(-C(2,1),(-C(1,3)*C(3,1)))-C1)*C(1,3)                     RANG0046
      RETURN                                                             RANG0047
      END                                                                RANG0048

*************************************************************************

      SUBROUTINE RATI (X,EPDX,XLIMIT,VAR,AT,BT,CT,ATH,BTH,CTH)           RATI0001
      COMMON /KVARTR/ KVAR(6)                                            RATI0002
      DIMENSION VAR(11),X(6),EPDX(11)                                    RATI0003
      RATIO=1.                                                           RATI0004
      RATIO1=1.                                                          RATI0005
      DO 10 I=1,6                                                        RATI0006
C         CHECK TO SEE IF ANY CORRECTION EXCEEDS LIMITS                  RATI0007
      IF(ABS(X(I)).GT.XLIMIT) RATIO1=ABS(XLIMIT/X(I))                    RATI0008
```

AD-A037 689 NAVAL AIR DEVELOPMENT CENTER WARMINSTER PA AIR VEHICL--ETC F/G 20/4
LOW-SPEED V/STOL STABILITY AND CONTROL PREDICTION. VOLUME II: C--ETC(U)
JAN 77 J W CLARK

UNCLASSIFIED NADC-76313-30 NL

2 OF 2
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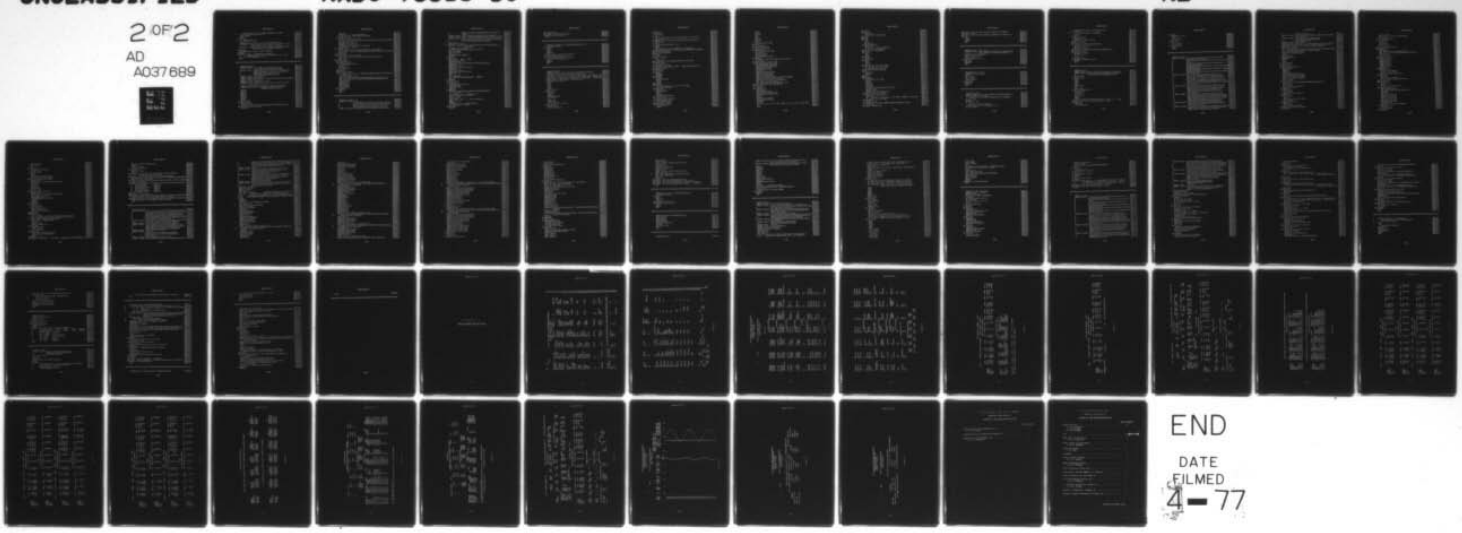

END

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C          CHOOSE RATIO SO THAT LARGEST CORRECTION = LIMIT                    RATI0009
      IF(RATIO.LE.RATIO1) GO TO 10                                            RATI0010
      RATIO=RATIO1                                                            RATI0011
      II=I                                                                    RATI0012
   10 CONTINUE                                                                RATI0013
C          MAKE CORRECTIONS                                                   RATI0014
      DO 20 I=1,6                                                             RATI0015
      VAR(KVAR(I))=VAR(KVAR(I))+X(I)*RATIO*EPDX(KVAR(I))                      RATI0016
      IF(KVAR( I ).EQ. 8.AND.(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.))           RATI0017
     1               VAR( 9)=AT +(BT +CT *VAR( 8))*VAR( 8)                   RATI0018
      IF(KVAR( I ).EQ.10.AND.(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.))           RATI0019
     1               VAR(11)=ATH+(BTH+CTH*VAR(10))*VAR(10)                    RATI0020
   20 CONTINUE                                                                RATI0021
      IF(RATIO.NE.1.) WRITE (6,40) X,RATIO,II                                 RATI0022
   30 RETURN                                                                  RATI0023
   40 FORMAT (1H0// 12H CORRECTIONS ,2X,6F11.7,                               RATI0024
     1       / 39H0RATIO APPLIED TO CORRECTION VECTOR IS  ,F10.7,             RATI0025
     2     17H  FROM COMPONENT  ,I3)                                          RATI0026
      END                                                                     RATI0027
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      SUBROUTINE REACT                                                        REAC0001
      COMMON /FORCE/  T1(7),XFRJ,T2(9),YFRJ,T3(12),ZFRJ,                      REAC0002
     1                T4(11),RMRJ,T5(12),PMRJ,T6(12),YMRJ                     REAC0003
      COMMON /RJETS/  NJETR,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),            REAC0004
     1                TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),              REAC0005
     2                AYBJTR(10),APRJTR(10),JTRCON(10)                        REAC0006
     3               ,XACT,TPCTA,TPCTB,NRCS,TJETR(10)                         REAC0007
      COMMON /LJETS/  T7(93),TLJET(6)                                         REAC0008
      COMMON /MANARO/ T8(3),TDELT                                             REAC0009
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)       REAC0010
      COMMON /STANRO/ J,W,LINK                                                REAC0011
      COMMON /STRIAB/ ADUM(543),XRJT(140)                                     REAC0012
      DIMENSION Y(10),Y1(10),Y2(10),NP(10),YC(10),Y1C(10),Y1L(10),            REAC0013
     1          Y2L(10),TJETC(10)                                             REAC0014
       RAMP(X,X1,X2)=(ABS(X-X1)-ABS(X2-X)+X2-X1)/(2.*(X2-X1))                 REAC0015
       TRAMP(X,X0,XD,XR,TP,TN)=TN*(RAMP(X,X0-XD-XR,X0-XD)-1.)                 REAC0016
     1                        +TP*RAMP(X,X0+XD,X0+XD+XR)                     REAC0017
      XFRJ=0.                                                                 REAC0018
      YFRJ=0.                                                                 REAC0019
      ZFRJ=0.                                                                 REAC0020
      RMRJ=0.                                                                 REAC0021
      PMRJ=0.                                                                 REAC0022
      YMRJ=0.                                                                 REAC0023
      SUMT=0.                                                                 REAC0024
      XPCT=1.                                                                 REAC0025
      DO 10 I=1,10                                                            REAC0026
   10 TJETR(I)=0.                                                             REAC0027
      DO 20 JJ=1,NRCS                                                         REAC0028
      IF((TLJET(JJ).LT.100.).AND.(NRCS.NE.0)) XPCT=XPCT-1./NRCS               REAC0029
   20 SUMT=SUMT+TLJET(JJ)/1000.                                               REAC0030
      TPCTA1=0.                                                               REAC0031
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      TPCTB1=0.                                                          REAC0032
      IF(XPCT.GT..05) TPCTA1=TPCTA/XPCT                                  REAC0033
      IF(XPCT.GT..05) TPCTB1=TPCTB/(XPCT**2)                             REAC0034
   30 DO 60 N=1,NJETR                                                    REAC0045
      IF(XR(N).LE.0.) XR(N)=.001                                         REAC0046
      TJETC(N)=TRAMP(XSTK(JTRCON(N)),X0(N),XD(N),XR(N),TPOS(N),TNEG(N))  REAC0047
      IF(LINK.NE.4) GOTO 50                                              REAC0048
      TAU1=XRJT(14*(N-1)+12)                                             REAC0049
      TAU2=XRJT(14*(N-1)+13)                                             REAC0050
      IF(TAU1.EQ.0..AND.TAU2.EQ.0.) GOTO 50                              REAC0051
      IF(TAU2.EQ.0.) GOTO 40                                             REAC0052
C ** SECOND ORDER                                                        REAC0053
      Y2(N)=(TJETC(N)-Y(N)-(TAU1+TAU2)*Y1(N))/(TAU1*TAU2)                REAC0054
      CALL RIEMAN (Y(N),Y1(N),Y2(N),TDELT/4.,NP(N),Y1C(N),YC(N),Y2L(N))  REAC0055
      GO TO 60                                                           REAC0056
C ** FIRST ORDER                                                         REAC0057
   40 Y1(N)=(TJETC(N)-Y(N))/TAU1                                         REAC0058
      CALL STLJES (Y(N),Y1(N),TDELT/4.,NP(N),YC(N),Y1L(N))               REAC0059
      GO TO 60                                                           REAC0060
C ** ZERO ORDER                                                          REAC0061
   50 YC(N)=TJETC(N)                                                     REAC0062
   60 TJETR(N)=YC(N)                                                     REAC0063
      IF(LINK.NE.2) GOTO 80                                              REAC0064
      DO 70 I=1,10                                                       REAC0065
      NP(I)=0                                                            REAC0066
      Y(I)=TJETR(I)                                                      REAC0067
   70 Y1(I)=0.                                                           REAC0068
   80 CONTINUE                                                           REAC0069
   90 DO 100 N=1,NJETR                                                   REAC0070
      IF((TPCTA1+TPCTB1).NE.0.) TJETR(N)=TJETR(N)*(TPCTA1+TPCTB1*SUMT)   REAC0071
     1     *SUMT/100.                                                    REAC0072
      TJETR(N)=TJETR(N)*XPCT                                             REAC0073
      CALL VR3D(TJETR(N),0.,0.,AYBJTR(N),APBJTR(N),0.,XF,YF,ZF,1)        REAC0074
      CALL XPRO(XAJETR(N),YAJETR(N),ZAJETR(N),XF,YF,ZF,RM,PM,YM)         REAC0075
      XFRJ=XF+XFRJ                                                       REAC0076
      YFRJ=YF+YFRJ                                                       REAC0077
      ZFRJ=ZF+ZFRJ                                                       REAC0078
      RMRJ=RM+RMRJ                                                       REAC0079
      PMRJ=PM+PMRJ                                                       REAC0080
      YMRJ=YM+YMRJ                                                       REAC0081
  100 CONTINUE                                                           REAC0082
      RETURN                                                             REAC0083
      END                                                                REAC0084

*************************************************************************

      SUBROUTINE READIN (T)                                              READ0001
      COMMON /STRIAB/ T1(184),                                           READ0002
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),      READ0003
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),T2(27),    READ0004
     4                XCON(63),XJET(14),T3(3),GUESS,T4(44),TZERO,        READ0005
     5                T5(3),XRJT(140),YRJT(7),XLJT(84),YLJT(7)           READ0006
      COMMON /STRIMA/ T6(24),KCIT(20),T7(4),TMAX,XCIT(20,6),T8(9),       READ0007
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     1                KREAD,T9,TSTAB(14),ZMAX2,ZMAX3,T10(3),ZDELT1,      READ0008
     2                ZDELT2                                             READ0009
      COMMON /TOPLOT/ T11(7),ICOM(20),IPSN,NPART,T12(3),NSCALE           READ0010
      COMMON /CONTR/ ADISP(3),ARATE(3),DELTA(4),THR(2),RPCT(3),XSYS(28)  READ0011
      COMMON /MET1/  XB(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21),    READ0012
     1               XJ(14),XC(63),YR(7),XR(140),XT(28),XD(7),XI(21),    READ0013
     2               YL(7),XL(64),XS(28),TS(14),XCM(20,6)                READ0014
      DATA IMET/0/                                                       READ0015
C • • NAMELIST DICTIONARY                                                READ0016
      NAMELIST /CHANGE/ XB,XW,YW,XE,YE,XF,YF,XJ,XC,YR,XR,XT,XD,XI,       READ0017
     1                  YL,XL,XS,TS                                      READ0018
      IF(NPART.EQ.6) GOTO 20                                             READ0019
      IF (NPART.NE.9.AND.NPART.NE.10) GO TO 10                           READ0020
      READ (5,CHANGE)                                                    READ0021
      CALL CONV(IMET)                                                    READ0022
      GUESS  =  2.                                                       READ0023
      IF (NPART.EQ.9) GUESS=0.                                           READ0024
      RETURN                                                             READ0025
   10 CONTINUE                                                           READ0026
      READ (5,70)    IPSN    ,ICOM                                       READ0027
      IF(IPSN.LT.0) IMET=1                                               READ0028
      IPSN=IABS(IPSN)                                                    READ0029
      READ(5,60) XB,XW,YW,XE,YE,XF,YF,XJ,XC,XT,XD,XI,TS                  READ0030
      READ(5,60) YR                                                      READ0031
      NJ14=YR(1)*14.+.5                                                  READ0032
      READ(5,60) (XR(I),I=1,NJ14)                                        READ0033
      READ(5,60) YL                                                      READ0034
      NJ14=YL(1)*14.+.5                                                  READ0035
      READ(5,60) (XL(I),I=1,NJ14)                                        READ0036
      READ(5,60) XS                                                      READ0037
      T=0.                                                               READ0038
      CALL CONV(IMET)                                                    READ0039
      IF  (NPART.EQ.1.OR.NPART.EQ.7)   RETURN                            READ0040
      GOTO 40                                                            READ0041
   20 NPART=2                                                            READ0042
      DO 30 I=1,14                                                       READ0043
   30 TSTAB(I)=0.                                                        READ0044
      IF(NSCALE.EQ.0) GOTO 40                                            READ0045
      READ(5,CHANGE)                                                     READ0046
      CALL CONV(IMET)                                                    READ0047
      GUESS=0.                                                           READ0048
   40 CONTINUE                                                           READ0049
      READ(5,60) TZERO,ZDELT1,ZMAX1,ZDELT2,ZMAX2,ZMAX3                   READ0050
      T   =   TZERO                                                      READ0051
      IF  (ZDELT1.EQ.0.)   ZDELT1  =  0.1                                READ0052
      IF(ZDELT2.EQ.0.) ZDELT2=ZDELT1                                     READ0053
      TMAX  =  ZMAX1                                                     READ0054
      DO 50 I=1,20                                                       READ0055
      READ (5,80)  NEXT,  J  ,(XCM (I,K),K=1,6)                          READ0056
      KCIT(I)  =  J                                                      READ0057
      KREAD  =  I                                                        READ0058
      IF(IMET.EQ.0) CALL CONV1(J,XCIT,I)                                 READ0059
      IF  (NEXT.EQ.0)   RETURN                                           READ0060
   50 CONTINUE                                                           READ0061
      RETURN                                                             READ0062
```

```
   60 FORMAT(7F10.0)                                                    READ0063
   70 FORMAT(2X,I8,6A10/7A10/7A10)                                      READ0064
   80 FORMAT(I1,I4,5X,6F10.0)                                           READ0065
      END                                                               READ0066

*******************************************************************************

      SUBROUTINE RIEMAN (Y,Y1,Y2,DT,NPASS,Y1C,YC,Y2L)                   RIEM0001
      IF(NPASS)20,10,20                                                 RIEM0002
   10 Y2L=Y2                                                            RIEM0003
      Y1C=Y1                                                            RIEM0004
      YC=Y                                                              RIEM0005
      NPASS=1                                                           RIEM0006
      GOTO 30                                                           RIEM0007
   20 YC=YC+Y1C*DT+(Y2+2.*Y2L)/6.*DT**2                                 RIEM0008
      Y1C=Y1C+DT*(Y2+Y2L)/2.                                            RIEM0009
   30 Y=YC+Y1C*DT+DT**2*(4.*Y2-Y2L)/6.                                  RIEM0010
      Y1=Y1C+DT*(3.*Y2-Y2L)/2.                                          RIEM0011
      Y2L=Y2                                                            RIEM0012
      RETURN                                                            RIEM0013
      END                                                               RIEM0014

*******************************************************************************

      SUBROUTINE ROOA                                                   ROOA0001
      COMMON /STRD/ X,Y,U,V,T,A(9,2),IY,IYS,G(6,2),SLIM,IO,ID           ROOA0002
      DIMENSION BS(6),DF(6),CS(6),UNP(11),EVL(2,2)                      ROOA0003
      EQUIVALENCE (DF(1),UN), (DF(2),VN), (DF(3),DUN), (DF(4),DVN), (DF ROOA0004
     1(5), DUN1), (DF(6),DVN1), ( UNP(11),YS), (UNP(1),U1), (UNP(2),U2),ROOA0005
     2(UNP(3),U3), (UNP(4),U4), (UNP(5), U5), (UNP(6),U6) , (UNP(7),U7),ROOA0006
     3(UNP(8),US1), (UNP(9),US2) , (UNP(10), US3)                       ROOA0007
      DATA FA,FB /1H ,1H*/                                              ROOA0008
      IFT=1                                                             ROOA0009
      IR=0                                                              ROOA0010
      IS=0                                                              ROOA0011
      IH=0                                                              ROOA0012
      ITF=0                                                             ROOA0013
      DO 10 I=1, IO                                                     ROOA0014
   10 BS(I)=0.                                                          ROOA0015
      DS= .0005                                                         ROOA0016
      TST=0.                                                            ROOA0017
      UNPV=0.                                                           ROOA0018
      SLIM2=SLIM*SLIM                                                   ROOA0019
      X = 5.272                                                         ROOA0020
      Y=0.                                                              ROOA0021
      GO TO 210                                                         ROOA0022
      ENTRY  ROOB                                                       ROOA0023
      IF (IFT-3 ) 20, 70, 220                                           ROOA0024
   20 EVL(1,IFT)=X                                                      ROOA0025
      EVL(2,IFT)=U                                                      ROOA0026
      GO TO (30,50),IFT                                                 ROOA0027
```

```
 30 X=10.53                                                                    R00A0028
 40 IFT=IFT+1                                                                  R00A0029
    GO TO 210                                                                  R00A0030
 50 X=0.                                                                       R00A0031
    IF ( EVL(2,1).NE. 0..OR. EVL(2,2). NE. 0. ) GO TO 60                       R00A0032
    WRITE (6,60)                                                               R00A0033
 60 FORMAT(43H FUNCTION VALUE IS ZERO FOR ALL VALUES OF X)                     R00A0034
    GO TO 590                                                                  R00A0035
 70 IFT=4                                                                      R00A0036
    IF(U.EQ.0..AND.V.EQ.0.) IH=1                                               R00A0037
 80 ICT=0                                                                      R00A0038
    FM=FA                                                                      R00A0039
    IF( ABS(G(IR+1,1))+ ABS(G(IR+1,2)))100,100,90                              R00A0040
 90 IF((X-G(IR+1,1))**2+(Y-G(IR+1,2))**2-.05*TST)150,150,160                   R00A0041
100 IF(IH)110,110,390                                                          R00A0042
110 IF(ITF)120,120,140                                                         R00A0043
120 DS=.01                                                                     R00A0044
    ITF=1                                                                      R00A0045
130 X = -.1274396                                                              R00A0046
    Y=X                                                                        R00A0047
    GO TO 170                                                                  R00A0048
140 IF(G(IR+1).EQ.0..AND.G(IR+2).EQ.0.) GO TO 130                              R00A0049
150 G(IR+1,1)=X                                                                R00A0050
    G(IR+1,2)=Y                                                                R00A0051
160 X= G(IR+1,1)*.999                                                          R00A0052
    Y=AMAX1( ABS(G(IR+1,2)*.999  ), ABS(1.E-3*G(IR+1,1)))                      R00A0053
170 DO 180 I=1,11                                                              R00A0054
180 UNP(I)=0.                                                                  R00A0055
    GO TO 210                                                                  R00A0056
190 DXN1=DX                                                                    R00A0057
    DYN1=DY                                                                    R00A0058
    DXSP=DXS                                                                   R00A0059
200 DX=DS*X                                                                    R00A0060
    DY=DS*Y                                                                    R00A0061
    DXS=DX*DX+DY*DY                                                            R00A0062
    X=X+DX                                                                     R00A0063
    Y=Y+DY                                                                     R00A0064
210 RETURN                                                                     R00A0065
220 ICT=ICT+1                                                                  R00A0066
    IF(U. EQ. 0..AND. V. EQ. 0. ) GO TO 500                                    R00A0067
    IF( IR)270,270,230                                                         R00A0068
230 CONTINUE                                                                   R00A0069
    DO 260 J=1,IS                                                              R00A0070
    XI=X-CS(J)                                                                 R00A0071
    YI=Y                                                                       R00A0072
    TS4=V/U                                                                    R00A0073
    IF(BS(J))250,250,240                                                       R00A0074
240 YI=(Y+Y)*XI                                                                R00A0075
    XI=(XI-Y)*(XI+Y)+BS(J)                                                     R00A0076
250 TS2=U/(XI*XI+YI*YI)                                                        R00A0077
    U=(XI+YI*TS4)*TS2                                                          R00A0078
260 V=(TS4*XI-YI)*TS2                                                          R00A0079
270 US= ABS(U)+ ABS(V)                                                         R00A0080
    U7=U7+US-US3                                                               R00A0081
    U6=U4                                                                      R00A0082
```

```
      US=U3                                                                  R00A0083
      U4=V-U2                                                                R00A0084
      U3=U-U1                                                                R00A0085
      U2=V                                                                   R00A0086
      U1=U                                                                   R00A0087
      US3=US2                                                                R00A0088
      US2=US1                                                                R00A0089
      US1=US                                                                 R00A0090
      IF(ICT-2)200,190,280                                                   R00A0091
  280 AVG=3./U7                                                              R00A0092
      DO 290 I=1,6                                                           R00A0093
  290 DF(I)=UNP(I)*AVG                                                       R00A0094
      IF(DY)320,300,320                                                      R00A0095
  300 DRN=DX/DXN1                                                            R00A0096
      TS3=(DUN-DRN*DUN1)*DRN                                                 R00A0097
      TS=1.+DRN                                                              R00A0098
      TS1=TS*DUN+TS3                                                         R00A0099
      TS5=-2.*UN*TS                                                          R00A0100
      TS7=TS1*TS1+2.*TS3*TS5                                                 R00A0101
  310 DXN1=DX                                                                R00A0102
      DX=TS5*DX/(TS1+ SIGN( SQRT( ABS(TS7)),TS1))                            R00A0103
      GO TO 370                                                              R00A0104
  320 DRN=(DX*DXN1+DY*DYN1)/DXSP                                             R00A0105
      DIN=(DY*DXN1-DX*DYN1)/DXSP                                             R00A0106
      TS1=DUN-DRN*DUN1+DIN*DVN1                                              R00A0107
      TS2=DVN-DIN*DUN1-DRN*DVN1                                              R00A0108
      TS3=DRN*TS1-DIN*TS2                                                    R00A0109
      TS4=DRN*TS2+DIN*TS1                                                    R00A0110
      TS=1.+DRN                                                              R00A0111
      TS1=TS*DUN-DVN*DIN+TS3                                                 R00A0112
      TS2=TS*DVN+DUN*DIN+TS4                                                 R00A0113
      TS5=2.*(VN*DIN-UN*TS)                                                  R00A0114
      TS6=-2.*(VN*TS+UN*DIN)                                                 R00A0115
      TS7=(TS1-TS2)*(TS1+TS2)+2.*(TS5*TS3-TS4*TS6)                           R00A0116
      TS8=2.*(TS1*TS2+TS4*TS5+TS3*TS6)                                       R00A0117
      TS9= ABS(TS7)* SQRT(1.+(TS8/TS7)**2)                                   R00A0118
      TS3= SQRT(.5 * ABS(TS9+TS7))                                           R00A0119
      TS4= SIGN( SQRT(.5* ABS(TS9-TS7)),TS8)                                 R00A0120
  330 IF(TS1*TS3+TS2*TS4 )340,350,350                                        R00A0121
  340 TS4=-TS4                                                               R00A0122
      TS3=-TS3                                                               R00A0123
  350 TS7=TS1+TS3                                                            R00A0124
      TS8=TS2+TS4                                                            R00A0125
      TS3=TS7**2+TS8**2                                                      R00A0126
      TS1=(TS5*TS7+TS6*TS8)/TS3                                              R00A0127
      TS2=(TS6*TS7-TS5*TS8)/TS3                                              R00A0128
      DXN1=DX                                                                R00A0129
      DYN1=DY                                                                R00A0130
      DX=TS1*DXN1-TS2*DYN1                                                   R00A0131
      DY=TS2*DXN1+TS1*DYN1                                                   R00A0132
      DXSP=DXS                                                               R00A0133
      Y=Y+DY                                                                 R00A0134
      IF ( ABS(Y) .GT. 1.E-5 .AND.  ABS(Y/X) .GT. 5.E-4 ) GO TO 360          R00A0135
      Y=0.                                                                   R00A0136
      DY=0.                                                                  R00A0137
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360 YS=Y*Y                                                                    R00A0138
370 X=X+DX                                                                    R00A0139
    TST=X*X+YS                                                                R00A0140
    IF(TST-1.E-15)380,380,410                                                 R00A0141
380 FM=FB                                                                     R00A0142
390 IM=0                                                                      R00A0143
400 X=0.                                                                      R00A0144
    Y=0.                                                                      R00A0145
    YS=0.                                                                     R00A0146
    GO TO 500                                                                 R00A0147
410 DXS=DX*DX+DY*DY                                                           R00A0148
    AT=DXS/TST                                                                R00A0149
    IF (AT .LE. 1.E-15 ) GO TO 510                                            R00A0150
    IF (ICT -21 ) 470,450,420                                                 R00A0151
420 IF(AT-ATX) 450,460,460                                                    R00A0152
430 AT=ATX                                                                    R00A0153
    X=XX                                                                      R00A0154
    Y=YX                                                                      R00A0155
    YS=YSX                                                                    R00A0156
440 FM=FB                                                                     R00A0157
    GO TO 510                                                                 R00A0158
450 ATX=AT                                                                    R00A0159
    XX=X                                                                      R00A0160
    YX=Y                                                                      R00A0161
    YSX=YS                                                                    R00A0162
460 IF (ICT .LT. 25 ) GO TO 470                                               R00A0163
    IF (AT .NE. ATX ) GO TO 430                                               R00A0164
    IF (ICT.GE. 40) GO TO 440                                                 R00A0165
470 IF(TST-SLIM2)210,210,550                                                  R00A0166
480 Y=-Y                                                                      R00A0167
    BS(IS)=YS                                                                 R00A0168
    IS=IS-1                                                                   R00A0169
490 ICT=0                                                                     R00A0170
500 AT=0.                                                                     R00A0171
510 CONTINUE                                                                  R00A0172
    IF(IR.EQ.6) GO TO 530                                                     R00A0173
    IR=IR+1                                                                   R00A0174
    IS=IS+1                                                                   R00A0175
    CS(IS)=X                                                                  R00A0176
    G(IR,1)=X                                                                 R00A0177
    G(IR,2)=Y                                                                 R00A0178
    IF(Y.NE.0..AND.ICT.GT.0) GO TO 480                                        R00A0179
    DO 520 I=1,2                                                              R00A0180
    TS2=EVL(1,I)-X                                                            R00A0181
    IF(YS.GT.0.) TS2=TS2*TS2+YS                                               R00A0182
520 EVL(2,I)=EVL(2,I )/TS2                                                    R00A0183
    D1=(EVL(2,1)+EVL(2,2))*.5                                                 R00A0184
    UNPT=D1*T                                                                 R00A0185
    IF (  ABS(EVL(2,1)-EVL(2,2)) . LE. 1.E-4*  ABS(D1)) GO TO 590             R00A0186
    IF (IR.LT. IO ) GO TO 80                                                  R00A0187
530 CONTINUE                                                                  R00A0188
    WRITE (6,540)                                                             R00A0189
540 FORMAT(41H SOLUTION EXCEEDS MAXIMUM NUMBER OF ROOTS)                      R00A0190
    GO TO 570                                                                 R00A0191
550 WRITE (6,560) SLIM                                                        R00A0192
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  560 FORMAT (23H NEXT ROOT GREATER THAN,F10.1,8H RADIANS)                R00A0193
  570 WRITE (6,580)                                                       R00A0194
  580 FORMAT (44H INCOMPLETE FUNCTION RESIDUE F(S) REMAINING.)            R00A0195
  590 ID= 0                                                               R00A0196
      IO=IP                                                               R00A0197
       X=UNPT                                                             R00A0198
      RETURN                                                              R00A0199
      END                                                                 R00A0200

*************************************************************************

      SUBROUTINE SLTE (PD ,J,L,M)                                         SLTE0001
      COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NUMRTS,GAINB,          SLTE0002
     1                INDEX,STGAIN(6),TSTAR,COELTD,SLOT(3,9)              SLTE0003
      DIMENSION PD(6,12),K(3,2)                                           SLTE0004
      DATA K /2,6,4,1,3,5/                                                SLTE0005
      DO 10 I=1,3                                                         SLTE0006
      SLOT(I,J)=PD(K(I,M),L)                                              SLTE0007
   10 CONTINUE                                                            SLTE0008
      CALL SRT                                                            SLTE0009
      RETURN                                                              SLTE0010
      END                                                                 SLTE0011

*************************************************************************

      SUBROUTINE SLTT (A,B,K)                                             SLTT0001
      DIMENSION A(3,9),B(3,9)                                             SLTT0002
      L=K+2                                                               SLTT0003
      DO 10 I=1,3                                                         SLTT0004
      DO 10 J=K,L                                                         SLTT0005
      A(I,J)=B(I,J)                                                       SLTT0006
      B(I,J)=0.                                                           SLTT0007
   10 CONTINUE                                                            SLTT0008
      RETURN                                                              SLTT0009
      END                                                                 SLTT0010

*************************************************************************

      SUBROUTINE SOLVE                                                    SOLV0001
      COMMON /STRIAB/ T1(80),X(6),T2(59),KM1,T3(350),PDPHI(6,7)           SOLV0002
      COMMON /TOPLOT/ T4(6),EXIT                                          SOLV0003
C         SOLUTION OF KM1 LINEAR EQUATIONS IN KM1 VARIABLES               SOLV0004
      N1 = 1 + KM1                                                        SOLV0005
      NM1=KM1-1                                                           SOLV0006
      DO 60M = 1, KM1                                                     SOLV0007
      K = M + 1                                                           SOLV0008
C         CHECK FOR ZERO ON DIAGONAL                                      SOLV0009
      IF(ABS(PDPHI(M,M)).GE.1.E-05)GO TO 40                               SOLV0010
      DO 10 I=K,KM1                                                       SOLV0011
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      IF(ABS(PDPHI(I,M)).GE.1.E-05)GO TO 20                              SOLV0012
   10 CONTINUE                                                           SOLV0013
C          SINGULAR MATRIX  NO SOLUTION                                  SOLV0014
      EXIT=1.                                                            SOLV0015
      RETURN                                                             SOLV0016
   20 DO 30 III=1,N1                                                     SOLV0017
      B=PDPHI(I,III)                                                     SOLV0018
      PDPHI(I,III)=PDPHI(M,III)                                          SOLV0019
   30 PDPHI(M,III)=B                                                     SOLV0020
   40 DO 50J = K, N1                                                     SOLV0021
   50 PDPHI(M,J)=PDPHI(M,J)/PDPHI(M,M)                                   SOLV0022
      IF(KM1.LT.K)GO TO 70                                               SOLV0023
      DO 60MP = K, KM1                                                   SOLV0024
      DO 60 J = K, N1                                                    SOLV0025
   60 PDPHI(MP,J)=PDPHI(MP,J)-PDPHI(MP,M)*PDPHI(M,J)                     SOLV0026
   70 DO 80M = 1, KM1                                                    SOLV0027
   80 X(M)=PDPHI(M,N1)                                                   SOLV0028
      DO 90K1 = 1, NM1                                                   SOLV0029
      J = N1 - K1                                                        SOLV0030
      K = J - 1                                                          SOLV0031
      DO 90M = 1, K                                                      SOLV0032
   90 X(M)=X(M)-PDPHI(M,J)*X(J)                                          SOLV0033
      RETURN                                                             SOLV0034
      END                                                                SOLV0035

*****************************************************************************

      SUBROUTINE SRT                                                     SRT00001
      COMMON /STRD/ UX,UY,U,V,T,A(9,2),I0,I02,G(6,2),SLIM,ID,IL          SRT00002
      COMMON /TRONIC/ UU(6),VV(6),TAU(22),DAMP(22),NR,GAINB,             SRT00003
     1               INDEX,STGAIN(6),TSTAR,CDL,SLOT(3,9)                 SRT00004
      DO 10 I=1,6                                                        SRT00005
      DO 10 J=1,2                                                        SRT00006
   10 G(I,J) = 0.                                                        SRT00007
      ID=6                                                               SRT00008
      I0=3                                                               SRT00009
      I02=9                                                              SRT00010
      IL=1                                                               SRT00011
      SLIM=10000.                                                        SRT00012
      T=1.                                                               SRT00013
      CALL  ROOA                                                         SRT00014
   20 UR =(UX-UY)*(UX+UY)                                                SRT00015
      UI= 2.*UX*UY                                                       SRT00016
      DO 30 L=1,3                                                        SRT00017
      M= 3*L-3                                                           SRT00018
      DO 30 I=1,3                                                        SRT00019
      N=M+I                                                              SRT00020
      K=3*I-2                                                            SRT00021
      A(N,1) = SLOT(L,K+2)+SLOT(L,K+1)*UX + SLOT (L, K  ) *UR            SRT00022
   30 A(N,2) = SLOT(L,K+1) *UY +SLOT (L,K   )*UI                         SRT00023
   40 CALL DET                                                           SRT00024
      CALL ROOB                                                          SRT00025
      IF (IL)20,50,20                                                    SRT00026
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   50 NR=ID                                                              SRT00027
      IF(NR.GT.4) NR=4                                                   SRT00028
      CDL=UX                                                             SRT00029
      DO 60 J=1,6                                                        SRT00030
      UU(J)=0.                                                           SRT00031
   60 VV(J)=0.                                                           SRT00032
      DO 70 J=1,ID                                                       SRT00033
      UU(J)=G(J,1)                                                       SRT00034
   70 VV(J)=G(J,2)                                                       SRT00035
      RETURN                                                             SRT00036
      END                                                                SRT00037

*********************************************************************************

      SUBROUTINE STAB                                                    STAB0001
      COMMON /FORCE/  XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,     STAB0002
     1                XFLJ,XFGUN,XFFIN,XFW,XADD,                         STAB0003
     2                YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW,  STAB0004
     D                YADD,                                              STAB0005
     3                ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,     STAB0006
     4                ZFLJ,ZFGUN,ZFW,ZADD,                               STAB0007
     5                QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,RMRJ,RMLJ,LGUN, STAB0008
     A                LFIN,RGYRO,RMADD,                                  STAB0009
     6                QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN, STAB0010
     B                MFIN,PGYRO,PMADD,                                  STAB0011
     7                QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN, STAB0012
     C                NFIN,YGYRO,YMADD                                   STAB0013
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,        STAB0014
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RHO,R12,SPD(6,6,1),     STAB0015
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),      STAB0016
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,      STAB0017
     4                DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),    STAB0018
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),  STAB0019
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7) STAB0020
     7               ,XLJT(84),YLJT(7)                                   STAB0021
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXU,YYD,ZZD,ALGF,APFP,AYFP,CGWL,     STAB0022
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),     STAB0023
     2                TIME,TMAX,XCIT(20,6),ALGEZ,ALGE1,ALGE2,CGSTA,      STAB0024
     3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,         STAB0025
     4                TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,        STAB0026
     5                ZDELT1,ZDELT2                                      STAB0027
      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,      STAB0028
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,   STAB0029
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,   STAB0030
     3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,   STAB0031
     4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,       STAB0032
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1          STAB0033
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,ARDD,AYDD,DTRR,GMAXV,RATE1,      STAB0034
     1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,     STAB0035
     2                LNGTH1,PILGH1,START2                               STAB0036
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW, STAB0037
     1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD,    STAB0038
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE             STAB0039
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     3                ,TLSTK(2),THLSTK(2)                                    STAB0040
      COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,        STAB0041
     1                PILGH2,PWGEL1                                          STAB0042
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                        STAB0043
     1                NPART,NVARA,NVARB,NVARC,NSCALE                         STAB0044
     1                ,NVARS,NPRINT,NTIME                                    STAB0045
      COMMON /KVARTR/ KVAR(6),PDI                                            STAB0046
      DIMENSION VAR(6),EPDD(6),A(74),KS(6),VAR1(11),UNIT(11),VARSV(11)       STAB0047
      DIMENSION PD1(6,12),KS1(6),PDN1(6,6),D(6),VARM(6),PDT(6,12)            STAB0048
      EQUIVALENCE (VAR(1),VXH),(A(1),XF),(VAR1(1),COLSTK)                    STAB0049
      REAL IX,IY,IZ,MASS                                                     STAB0050
      DATA F1,F2,F3,F4,F5,F6,F7,F8,F9/.224809,.393701,.737562,10.76391,      STAB0051
     1     35.31466,.571015,.737562,.050539,3.28084/                         STAB0052
      DATA KS/13,23,35,48,61,74/                                             STAB0053
      DATA KS1/1,14,24,62,49,36/                                             STAB0054
      LINK=3                                                                 STAB0055
      DO 10 N=1,11                                                           STAB0056
      VARSV(N)=VAR1(N)                                                       STAB0057
   10 CONTINUE                                                               STAB0058
      J=2                                                                    STAB0059
      KM1=6                                                                  STAB0060
      DO 20 LL=1,74                                                          STAB0061
   20 E(LL)=A(LL)                                                            STAB0062
      DO 30 LL=1,6                                                           STAB0063
   30 PD1(LL,12)=-A(KS1(LL))                                                 STAB0064
      CALL BJACOB                                                            STAB0065
      KOUNTS=0                                                               STAB0066
      DCOL=0.                                                                STAB0067
      COLS=COLSTK                                                            STAB0068
      UNIT(1)=100.*RANGE/COLL(I)                                             STAB0069
      UNIT(2)=100.*CYCF(3)/CYCF(1)                                           STAB0070
      UNIT(3)=100.*CYCL(3)/CYCL(1)                                           STAB0071
      UNIT(4)=100.*PEDA(3)/PEDA(1)                                           STAB0072
      DO 40 LL=8,11                                                          STAB0073
   40 UNIT(LL)=DTR                                                           STAB0074
      CALL VR3D (XXD,YYD,ZZD,AYE,APE,ARE,VXB,VYB,VZB,-1)                     STAB0075
      DO 50 J=1,4                                                            STAB0076
      DO 50 I=1,6                                                            STAB0077
      PD1(I,J)=PD1(I,J)*UNIT(J)                                              STAB0078
      PD(I,J)=PD1(I,J)                                                       STAB0079
   50 CONTINUE                                                               STAB0080
      DO 60 J=8,11                                                           STAB0081
      DO 60 I=1,6                                                            STAB0082
      PD1(I,J)=PD1(I,J)*UNIT(J)                                              STAB0083
   60 CONTINUE                                                               STAB0084
      DO 90 J=1,11                                                           STAB0085
      FM=F2                                                                  STAB0086
      IF(J.GT.4.AND.J.LT.8) FM=1.                                            STAB0087
      DO 70 I=1,6                                                            STAB0088
      PDT(I,J)=PD1(I,J)                                                      STAB0089
   70 CONTINUE                                                               STAB0090
      DO 80 I=1,3                                                            STAB0091
      PD1(I,J)=PD1(I,J)*FM/F1                                                STAB0092
   80 PD1(I+3,J)=PD1(I+3,J)*FM/F7                                            STAB0093
   90 CONTINUE                                                               STAB0094
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      WRITE (6,390)                                                    STAB0095
      CALL WRVP1 (1,VAR,KM1,PD,TAXL,TAXR)                              STAB0096
      DO 100 I=1,3                                                     STAB0097
  100 D(I)=MASS*14.5939                                                STAB0098
      D(4)=IZ/F3                                                       STAB0099
      D(5)=IY/F3                                                       STAB0100
      D(6)=IX/F3                                                       STAB0101
      DO 120 J=1,11                                                    STAB0102
      DO 110 I=1,6                                                     STAB0103
  110 PD1(I,J)=PD1(I,J)/D(I)                                           STAB0104
  120 CONTINUE                                                         STAB0105
      WRITE(6,380)                                                     STAB0106
      CALL WRVP1(1,VAR,KM1,PD,TAXL,TAXR)                               STAB0107
      CALL VR3D (0.,0.,W,AYE,APE,ARE,XFW,YFW,ZFW,-1)                   STAB0108
      DO 130 I=1,6                                                     STAB0109
      DO 130 J=1,11                                                    STAB0110
  130 PD1(I,J)=PDT(I,J)                                                STAB0111
      EPDD(1)=XIT(4)                                                   STAB0112
      EPDD(2)=XIT(4)                                                   STAB0113
      EPDD(3)=XIT(6)                                                   STAB0114
      EPDD(4)=XIT(4)                                                   STAB0115
      EPDD(5)=XIT(6)                                                   STAB0116
      EPDD(6)=XIT(6)                                                   STAB0117
      DO 140 I=1,6                                                     STAB0118
  140 KVAR(I)=I                                                        STAB0119
      DO 210 J=1,6                                                     STAB0120
      VAR(J)=VAR(J)+EPDD(J)                                            STAB0121
      IF(J.EQ.1) GO TO 150                                             STAB0122
      VAR(J-1)=VAR(J-1)-EPDD(J-1)                                      STAB0123
  150 CONTINUE                                                         STAB0124
      CALL ANAL                                                        STAB0125
      IF(EXIT.NE.0.) RETURN                                            STAB0126
      GO TO (160,170,160,170,160,170),J                                STAB0127
  160 WRITE(6,360)                                                     STAB0128
  170 TV=VAR(3)                                                        STAB0129
      DO 180 I=1,6                                                     STAB0130
      FM=F9                                                            STAB0131
      IF(I.EQ.3.OR.I.GT.4) FM=1.                                       STAB0132
  180 VARM(I)=VAR(I)/FM                                                STAB0133
      VARM(3)=VARM(3)*DTRR                                             STAB0134
      CALL WRVP(1,VARM,KM1,PD,TAXL,TAXR)                               STAB0135
      VAR(3)=TV                                                        STAB0136
      CALL WRFM                                                        STAB0137
      SPD(J,1,1)=XF-E( 1)                                              STAB0138
      SPD(J,2,1)=ZF-E(24)                                              STAB0139
      SPD(J,3,1)=QM-E(49)                                              STAB0140
      SPD(J,4,1)=YF-E(14)                                              STAB0141
      SPD(J,5,1)=QL-E(36)                                              STAB0142
      SPD(J,6,1)=QN-E(62)                                              STAB0143
      DO 190 K=1,6                                                     STAB0144
      SPD(J,K,1)=SPD(J,K,1)/EPDD(J)                                    STAB0145
  190 CONTINUE                                                         STAB0146
      DO 200 K=1,74                                                    STAB0147
      A(K)=A(K)-E(K)                                                   STAB0148
  200 CONTINUE                                                         STAB0149
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      WRITE (6,370)                                                    STAB0150
      CALL WRFM                                                        STAB0151
      L=1                                                              STAB0152
  210 CONTINUE                                                         STAB0153
      VAR(6)=VAR(6)-EPDD(6)                                            STAB0154
      DO 220 I=1,6                                                     STAB0155
      DO 220 J=1,6                                                     STAB0156
      FN=F9                                                            STAB0157
      FD=F1                                                            STAB0158
      IF(I.EQ.3.OR.I.GT.4) FN=1.                                       STAB0159
      IF(J.EQ.3.OR.J.GT.4)FD=F7                                        STAB0160
  220 PDN1(I,J)=SPD(I,J,1)*FN/FD                                       STAB0161
      WRITE(6,330)                                                     STAB0162
      WRITE(6,350) ((PDN1(I,J),I=1,6),J=1,6)                           STAB0163
      D(4)=D(3)                                                        STAB0164
      D(3)=D(5)                                                        STAB0165
      D(5)=D(6)                                                        STAB0166
      D(6)=IZ/F3                                                       STAB0167
      DO 230 I=1,6                                                     STAB0168
      DO 230 J=1,6                                                     STAB0169
  230 PDN1(I,J)=PDN1(I,J)/D(J)                                         STAB0170
      WRITE(6,340)                                                     STAB0171
      WRITE(6,350) ((PDN1(I,J),I=1,6),J=1,6)                           STAB0172
      IF (V.LE.0.) GO TO 290                                           STAB0173
      XAELW=XAELE-XAWG                                                 STAB0174
      IF(QWG.GE..5*Q) GO TO 240                                        STAB0175
      QWG=.5*Q                                                         STAB0176
      CWING=1.                                                         STAB0177
      SWING=1.                                                         STAB0178
  240 CONTINUE                                                         STAB0179
      DO 260 J=1,4                                                     STAB0180
      DO 250 I=1,6                                                     STAB0181
      PD(I,J)=PD(I,J)/V                                                STAB0182
      PD1(I,J)=PD1(I,J)/V                                              STAB0183
      PD1(I,J+7)=PD1(I,J+7)/V                                          STAB0184
  250 CONTINUE                                                         STAB0185
  260 CONTINUE                                                         STAB0186
      DO 261 J=1,11                                                    STAB0186
      CALL VR2D(PD1(1,J),PD1(3,J),AP,PD1(1,J),PD1(3,J),-1)             STAB0186
  261 CALL VR2D(PD1(6,J),PD1(4,J),AP,PD1(6,J),PD1(4,J),-1)             STAB0186
      CALL LMODE (V,QWG,0.,W,CWING,XAELW)                              STAB0187
      CALL LAMODF (V,QWG,W,SWING)                                      STAB0188
      LINK=4                                                           STAB0189
      DO 270 J=1,13                                                    STAB0190
      TSTAB(J)=TSTAB(J+1)                                              STAB0191
  270 CONTINUE                                                         STAB0192
      TSTAB(14)=9999.                                                  STAB0193
      DO 280 J=1,11                                                    STAB0194
      VAR1(J)=VARSV(J)                                                 STAB0195
  280 CONTINUE                                                         STAB0196
      CALL TIMEX (TUSED,DTIME,TLEFT)                                   STAB0197
      WRITE (6,320) DTIME,TUSED                                        STAB0198
      RETURN                                                           STAB0199
  290 WRITE (6,300) V                                                  STAB0200
  300 FORMAT (//10H **** V = ,F10.2,61H  LINEARIZED, NON-DIMENSIONAL STASTAB0201
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     1BILITY ANALYSIS SKIPPED ****)                                          STAB0202
      LINK=4                                                                 STAB0203
      DO 310 J=1,13                                                          STAB0204
      TSTAB(J)=TSTAB(J+1)                                                    STAB0205
  310 CONTINUE                                                               STAB0206
      TSTAB(14)=9999.                                                        STAB0207
      RETURN                                                                 STAB0208
  320 FORMAT (1H0,10X,F7.3,22H MINUTES USED IN STAB ,5X,F8.3,                STAB0209
     1         23H MINUTES TOTAL RUN TIME)                                   STAB0210
  330 FORMAT (1H1,51X,29HSTABILITY DERIVATIVE MATRICES///                    STAB0211
     120X,83HTHE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON.METRES      STAB0212
     2PER METRE/SEC OR RAD/SEC//)                                           STAB0213
  340 FORMAT (//30X,65HTHE FOLLOWING MATRIX HAS UNITS OF 1/SEC. METRE/SECSTAB0214
     1C OR 1/METRE.SEC//)                                                   STAB0215
  350 FORMAT (1H0,30X,1HU,17X,1HW,17X,1HQ,17X,1HV,17X,1HP,17X,1HR/140,      STAB0216
     1     4X,16HX-FORCE          ,6G18.7/                                  STAB0217
     2     5X,16HZ-FORCE          ,6G18.7/                                  STAB0218
     3     5X,16HPITCH MOMENT     ,6G18.7/                                  STAB0219
     4    /5X,16HY-FORCE          ,6G18.7/                                  STAB0220
     5     5X,16HROLL MOMENT      ,6G18.7/                                  STAB0221
     6     5X,16HYAW MOMENT       ,6G18.7//)                                STAB0222
  360 FORMAT (1H1)                                                          STAB0223
  370 FORMAT (1H ,63X,5HDELTA)                                              STAB0224
  380 FORMAT(///,13X, 97HTHE FOLLOWING MATRIX HAS UNITS OF METRES/SEC**2STAB0225
     1 OR RAD/SEC**2 PER CM. OF CONTROL OR RAD. OF ANGLE)                   STAB0226
  390 FORMAT(1H1,15X, 94HTHE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NESTAB0227
     1WTON.METRES PER CM. OF CONTROL OR RAD. OF ANGLE)                      STAB0228
      END                                                                   STAB0229

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      SUBROUTINE START                                                      STAR0001
      COMMON /STRIAB/ T1(92),IX,IY,IZ,T2(42),DTR,T3,ERR(6),T4,RHO,R12,      STAR0002
     1               T5(36),XEL(14),XER(7),XFC(28),XFN(7),XFS(35),T6(7),    STAR0003
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,         STAR0004
     4                DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),       STAR0005
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),     STAR0006
     6                STACG,TZERO,DTRRSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)    STAR0007
     7               ,XLJT(84),YLJT(7),XRAM,ZRAM,RAMM                       STAR0008
      COMMON /STRIMA/ T7(2),AGW,IXZ,XXD,YYD,ZZD,ALGF,T8(2),CGWL,T9(158),    STAR0009
     1                ALGEZ,T10(2),CGSTA,T11(6),PIU30,TSTAB(14)           STAR0010
      COMMON /STAMAN/ T12(8),CGBL,T13(10),TWOPI,T14(7),P01DTR               STAR0011
      COMMON /MANAL/  Q,T15(2),QWG,T16,TAXL,TAXR,XAWG,ZAWG,T17(17),         STAR0012
     3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,      STAR0013
     4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,          STAR0014
     5                ALECRI,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1             STAR0015
      COMMON /ROMAN/  PI,Z7,ALT,T,T18(3),DTRR                               STAR0016
      COMMON /MANARO/ T19(19),                                              STAR0017
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE                STAR0018
     3               ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH               STAR0019
     4               ,DFLAP1,FAIL(6)                                        STAR0020
      COMMON /STANRO/ J,W,LINK,QELE,VSND,T20(4),COND1                       STAR0021
      COMMON /STARAN/ C3,C4,RW,CLP,CLR,DCD,DQL,DQN,CLBO,CNBO,ETAQ,NJET,     STAR0022
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     1                 QFIN,CLRCL,YFS(14),CNHCL,CNPCL,CNRCD,CNRCL,COLKS,  STAR0023
     2                 D3ELF,FNSWC,LWING,RPIST,YAERO(31,3),APHJET,AHBJET, STAR0024
     3                 AYBJFT,CNPCD1,CNPCD2,COLJET,DXWGEL,DZWGEL,ETADMX,  STAR0025
     4                 PWGWK1,RCWING,SWINGH,ANGR,ANGL,DFLAP               STAR0026
      COMMON /KVARTR/ KVAR(6)                                             STAR0027
      COMMON /PJETS/  NJETP,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),        STAR0028
     1                TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),         STAR0029
     2                AYBJTR(10),APHJTR(10),JTRCON(10)                   STAR0030
     3               ,XACT,TPCTA,TPCTB,NRCS                              STAR0031
      COMMON /LJETS/  NJETL,XAJETL(6),YAJETL(6),ZAJETL(6),APHJTL(6),     STAR0032
     1                ARBJTL(6),CONLJ(2,5),NCONL(6),XLT(2),XLTH(2)       STAR0033
     2               ,AYBJTL(6),ATT(6),ANG(6),PSIANG(6),THEANG(6)        STAR0034
     3               ,ANGA(6),ANGB(6),TLJET(6),ANGC(6)                   STAR0035
     4               ,THLJET(6),TL(2,6),NLINK                            STAR0036
      COMMON /CONTR/ DUM1(15),XSYS(28),NTRIM                              STAR0037
      COMMON /MET1/  XB(35),XW(21),YW(21),XE(14),YE(21),XF(7),YF(21),     STAR0038
     1               XJ(14),XC(63),YR(7),XA(140),XT(28),XG(7),XI(21),     STAR0039
     2               YL(7),XL(84),XS(28),TS(14)                           STAR0040
      DIMENSION HEAD(2,14)                                                STAR0041
      REAL IX,IY,IZ,IXZ                                                   STAR0042
      DATA LR,LW/5,6/                                                     STAR0043
      DATA HEAD/                                                          STAR0044
     1 1H ,10H  FUSELAGE,10H        RE,10HACTION JET,1H ,10H  LIFT JET,  STAR0045
     2 1H ,10H       WING,1H ,10H  ELEVATOR,1H ,10HFIN/RUDDER,1H ,       STAR0046
     3 10H        JET,3*1H ,10H  CONTROLS,10H    FLIGHT,10H CONSTANTS,   STAR0047
     4 10H     ALLOW,10HABLE ERROR,1H ,10H ITERATION,1H ,10HSTAB TIMES,  STAR0048
     5 2*1H /                                                             STAR0049
      GUESS=0.                                                            STAR0050
       NTRIM=0                                                            STAR0051
C     READ IN DATA THRU SUBROUTINE READIN.                                STAR0052
      CALL READIN (T)                                                     STAR0053
C     CALCULATE PHYSICAL CONSTANTS.                                       STAR0054
      DTR=.17453292SE-01                                                  STAR0055
      RHO=.002378*XFC(28)                                                 STAR0056
      Q=.5*RHO                                                            STAR0057
      PIU30=9.54929658                                                    STAR0058
      DTRRSQ=3282.80635                                                   STAR0059
      DTRR=57.2957795                                                     STAR0060
      R12=1./12.                                                          STAR0061
      PI=3.1415926536                                                     STAR0062
      P01DTR=.174532925E-03                                               STAR0063
      HALFPI=1.570796327                                                  STAR0064
      TWOPI=6.283185307                                                   STAR0065
C     WRITE OUT HEADINGS.                                                 STAR0066
      CALL WROT                                                           STAR0067
      WRITE (LW,90)                                                       STAR0068
      WRITE (LW,100) (HEAD(I,1),I=1,2),XB                                 STAR0069
C     CALCULATE CONSTANTS FOR FUSELAGE - SEE INPUT FORMAT GUIDE FOR       STAR0070
C        DESCRIPTION OF CONSTANTS.                                        STAR0071
      W=XFS(1)                                                            STAR0072
      STACG=XFS(5)*R12                                                    STAR0073
      BLCG=XFS(6)*R12                                                     STAR0074
      WLCG=XFS(7)*R12                                                     STAR0075
      CGSTA=XFS(5)                                                        STAR0076
      CGBL=XFS(6)                                                         STAR0077
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      CGWL=XFS(7)                                                        STAR0078
      XAFUS=STACG-XFS(2)*R12                                             STAR0079
      YAFUS=XFS(3)*R12-BLCG                                              STAR0080
      ZAFUS=WLCG-XFS(4)*R12                                              STAR0081
      IX=XFS(8)                                                          STAR0082
      IY=XFS(9)                                                          STAR0083
      IZ=XFS(10)                                                         STAR0084
      IXZ=XFS(11)                                                        STAR0085
      YFS(1)=XFS(15)*DTR                                                 STAR0086
      YFS(2)=XFS(23)*DTR                                                 STAR0087
      YFS(3)=XFS(28)*DTR                                                 STAR0088
      XRAM=STACG-XFS(33)*R12                                             STAR0089
      ZRAM=XFS(34)*R12-WLCG                                              STAR0090
      RAMM=XFS(35)/32.17                                                 STAR0091
      WRITE (LW,100) (HEAD(I,4),I=1,2),XW ,YW                            STAR0092
C     CALCULATE CONSTANTS FOR WING - SEE INPUT FORMAT GUIDE FOR          STAR0093
C        DESCRIPTION OF CONSTANTS.                                       STAR0094
      QWG=.5*Q*XWG(1)                                                    STAR0095
      XAWG=STACG-XWG(2)*R12                                              STAR0096
      YAWG=XWG(3)*R12-BLCG                                               STAR0097
      ZAWG=WLCG-XWG(4)*R12                                               STAR0098
      AGW=XWG(5)*DTR                                                     STAR0099
      PWGWK1  =XWG(9)*DTR                                                STAR0100
      ETAQMX=2.42                                                        STAR0101
      CL80=XWG(12)                                                       STAR0102
      CLBCL=XWG(13)                                                      STAR0103
      CLR=XWG(14)                                                        STAR0104
      CLP=XWG(15)                                                        STAR0105
      CN80=XWG(16)                                                       STAR0106
      CNBCL=XWG(17)                                                      STAR0107
      CNRCL=XWG(18)                                                      STAR0108
      CNRCD=XWG(19)*DTR                                                  STAR0109
      CNPCL=XWG(20)                                                      STAR0110
      CNPCD=XWG(21)                                                      STAR0111
      DFLAP=XFC(19)                                                      STAR0112
      DFLAP1=DFLAP                                                       STAR0113
      WRITE (LW,100) (HEAD(I,5),I=1,2),XE ,YE                            STAR0114
C     CALCULATE CONSTANTS FOR ELEVATOR - SEE INPUT FORMAT GUIDE FOR      STAR0115
C        DESCRIPTION OF CONSTANTS.                                       STAR0116
      QELE=Q*XEL(1)                                                      STAR0117
      XAELE=STACG-XEL(2)*R12                                             STAR0118
      YAELE=XEL(3)*R12-BLCG                                              STAR0119
      ZAELE=WLCG-XEL(4)*R12                                              STAR0120
      ALGEZ=XEL(5)*DTR                                                   STAR0121
      WRITE (LW,100) (HEAD(I,6),I=1,2),XF ,YF                            STAR0122
C     CALCULATE CONSTANTS FOR  FIN/RUDDER - SEE INPUT FORMAT GUIDE FOR   STAR0123
C        DESCRIPTION OF CONSTANTS.                                       STAR0124
      QFIN=Q*XFN(1)                                                      STAR0125
      XAFIN=STACG-XFN(2)*R12                                             STAR0126
      YAFIN=XFN(3)*R12-BLCG                                              STAR0127
      ZAFIN=WLCG-XFN(4)*R12                                              STAR0128
      ALGF=XFN(5)*DTR                                                    STAR0129
      FNSWC=1.-XFN(7)                                                    STAR0130
      WRITE (LW,100) (HEAD(I,7),I=1,2),XJ                                STAR0131
C     CALCULATE CONSTANTS FOR JET - SEE INPUT FORMAT GUIDE FOR           STAR0132
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C        DESCRIPTION OF CONSTANTS.                                          STAR0133
      NJET=XJET(1)                                                          STAR0134
      XAJET=STACG-XJET(4)*R12                                               STAR0135
      YAJET=XJET(5)*R12-BLCG                                                STAR0136
      ZAJET=WLCG-XJET(6)*R12                                                STAR0137
      AYAJET=XJET(8)*DTR                                                    STAR0138
      APAJET=XJET(9)*DTR                                                    STAR0139
      ANGR=XJET(10)                                                         STAR0140
      ANGL=XJET(11)                                                         STAR0141
      NJETR=YRJT(1)+.5                                                      STAR0142
      NJ14=NJETR*14                                                         STAR0143
      XACT=YRJT(2)                                                          STAR0144
      TPCTA=YRJT(3)                                                         STAR0145
      TPCTH=YRJT(4)                                                         STAR0146
      NRCS=YRJT(5)+.1                                                       STAR0147
      WRITE (LW,100) (HEAD(I,2),I=1,2),YR  ,(XA  (II),II=1,NJ14)           STAR0148
C     CALCULATE CONSTANTS FOR REACTION JETS - SEE INPUT FORMAT GUIDE FORSTAR0149
C        DESCRIPTION OF CONSTANTS.                                          STAR0150
      DO 10 I=1,NJETR                                                       STAR0151
      XAJETR(I)=STACG-XRJT(14*I-13)*R12                                     STAR0152
      YAJETR(I)=XRJT(14*I-12)*R12-BLCG                                      STAR0153
      ZAJETR(I)=WLCG-XRJT(14*I-11)*R12                                      STAR0154
      AYBJTR(I)=XRJT(14*I-10)*DTR                                           STAR0155
      APBJTR(I)=XRJT(14*I- 9)*DTR                                           STAR0156
      JTRCON(I)=XRJT(14*I-8)+.5                                             STAR0157
      XO(I)=XRJT(14*I-7)                                                    STAR0158
      XD(I)=XRJT(14*I-6)                                                    STAR0159
      XR(I)=XRJT(14*I-5)                                                    STAR0160
      IF(XR(I).LE.0.0) XR(I)=0.01                                           STAR0161
      TPOS(I)=XRJT(14*I-4)                                                  STAR0162
      TNEG(I)=XRJT(14*I-3)                                                  STAR0163
   10 CONTINUE                                                              STAR0164
      NJETL=YLJT(1)+.5                                                      STAR0165
      NJ14=NJETL*14                                                         STAR0166
      WRITE (LW,100) (HEAD(I,3),I=1,2),YL  ,(XL  (II),II=1,NJ14)           STAR0167
C     CALCULATE CONSTANTS FOR LIFT JETS - SEE INPUT FORMAT GUIDE FOR        STAR0168
C        DESCRIPTION OF CONSTANTS                                           STAR0169
      DO 20 I=1,NJETL                                                       STAR0170
      XAJETL(I)=STACG-XLJT(14*I-13)*R12                                     STAR0171
      YAJETL(I)=XLJT(14*I-12)*R12-BLCG                                      STAR0172
      ZAJETL(I)=WLCG-XLJT(14*I-11)*R12                                      STAR0173
      APBJTL(I)=XLJT(14*I-10)*DTR                                           STAR0174
      ARBJTL(I)=XLJT(14*I-9)*DTR                                            STAR0175
      AYBJTL(I)=XLJT(14*I-8)*DTR                                            STAR0176
      ATT(I)=XLJT(14*I-7)                                                   STAR0177
      ANG(I)=XLJT(14*I-6)                                                   STAR0178
      PSIANG(I)=XLJT(14*I-5)*DTR                                            STAR0179
      THEANG(I)=XLJT(14*I-4)*DTR                                            STAR0180
      ANGA(I)=XLJT(14*I-3)/100.                                             STAR0181
      ANGB(I)=XLJT(14*I-2)/100.                                             STAR0182
      ANGC(I)=XLJT(14*I-1)/100.                                             STAR0183
   20 CONTINUE                                                              STAR0184
      DO 30 I=1,6                                                           STAR0185
      FAIL(I)=1.                                                            STAR0186
   30 NCONL(I)=XCON(12+I)+.5                                                STAR0187
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      DO 40 I=1,2                                                        STAR0188
      DO 40 J=1,5                                                        STAR0189
      CONLJ(I,J)=XCON(5*I+J-3)                                           STAR0190
   40 CONTINUE                                                           STAR0191
      AT=XCON(19)                                                        STAR0192
      BT=XCON(20)                                                        STAR0193
      CT=XCON(21)                                                        STAR0194
      ATH=XCON(22)                                                       STAR0195
      BTH=XCON(23)                                                       STAR0196
      CTH=XCON(24)                                                       STAR0197
      NLINK=XCON(35)+.5                                                  STAR0198
      DO 50 I=1,2                                                        STAR0199
      DO 50 II=1,6                                                       STAR0200
      TL(I,II)=XCON(29+6*I+II)                                           STAR0201
   50 CONTINUE                                                           STAR0202
      WRITE (LW,100) (HEAD(I,9),I=1,2),(XC  (I),I=1,49)                  STAR0203
      WRITE (LW,110) (XC  (I),I=50,63)                                   STAR0204
      CALL CON1 (XCON,COLJET)                                            STAR0205
      WRITE (LW,100) (HEAD(I,10),I=1,2),XT                               STAR0206
      XXD=XFC(1)*1.6878                                                  STAR0207
      YYD=XFC(2)*1.6878                                                  STAR0208
      ZZD=-XFC(3)                                                        STAR0209
      ZZ=-XFC(4)                                                         STAR0210
       IF(GUESS.EQ.2.) GO TO 60                                          STAR0211
      AYE=XFC(5)*DTR                                                     STAR0212
      ARE=XFC(7)*DTR                                                     STAR0213
      APE=XFC(6)*DTR                                                     STAR0214
      COLSTK=XFC(8)                                                      STAR0215
      CYSTK1=XFC(9)                                                      STAR0216
      CYSTK2=XFC(10)                                                     STAR0217
      PEDAL=XFC(11)                                                      STAR0218
      TLSTK(1)=XFC(15)                                                   STAR0219
      TLSTK(2)=XFC(16)                                                   STAR0220
      IF(AT.NE.0..OR.BT.NE.0..OR.CT.NE.0.) TLSTK(2)=AT+(BT+CT*TLSTK(1))*STAR0221
     1           TLSTK(1)                                                STAR0222
      THLSTK(1)=XFC(17)                                                  STAR0223
      THLSTK(2)=XFC(18)                                                  STAR0224
      IF(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.) THLSTK(2)=ATH+(BTH+CTH*    STAR0225
     1           THLSTK(1))*THLSTK(1)                                    STAR0226
      QUESS=2.                                                           STAR0227
   60 CONTINUE                                                           STAR0228
      DO 70 K=1,6                                                        STAR0229
   70 KVAR(K)=XIT(14+K)                                                  STAR0230
      TAXR=COLJET*COLSTK                                                 STAR0231
      IF (NJET.LE.0) TAXR=0.                                             STAR0232
      TAXL=COLJET*COLSTK                                                 STAR0233
      IF (NJET.LE.1) TAXL=0.                                             STAR0234
   80 CONTINUE                                                           STAR0235
      VSND=1./XFC(27)                                                    STAR0236
      WRITE (LW,100) (HEAD(I,11),I=1,2),XG                               STAR0237
C     CALCULATE ALLOWABLE ERRORS.                                        STAR0238
      ERR(1)=XER(1)                                                      STAR0239
      ERR(2)=XER(2)                                                      STAR0240
      ERR(3)=XER(3)                                                      STAR0241
      ERR(4)=XER(4)                                                      STAR0242
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      ERR(5)=XER(4)                                                    STAR0243
      ERR(6)=XER(5)                                                    STAR0244
      WRITE (LW,100) (HEAD(I,12),I=1,2),XI                             STAR0245
      MXPASS=XIT(1)                                                    STAR0246
      COND1=XIT(5)                                                     STAR0247
      XLIMIT=2.*DTR*XIT(12)                                            STAR0248
      XMIN=XIT(13)*DTR                                                 STAR0249
      DAMP=XIT(14)                                                     STAR0250
      WRITE (LW,100) (HEAD(I,13),I=1,2),TS                             STAR0251
      WRITE(LW,120) XS                                                 STAR0252
C     CALCULATE CONSTANTS FOR SUBROUTINE CLCD.                         STAR0253
      CALL YFIX (YWG,YAERO)                                            STAR0254
      CALL MNEM                                                        STAR0255
      RETURN                                                           STAR0256
   90 FORMAT (1H0//1H ,61X,10HINPUT DATA/)                             STAR0257
  100 FORMAT (1H0,55X,2A10,6H GROUP/(1H ,3X,7G18.7))                   STAR0258
  110 FORMAT (1H0,54X,18HINTERFERENCE GROUP/(1H ,3X,7G18.7))           STAR0259
  120 FORMAT (1H0,57X,20HCONTROL SYSTEM GROUP/(   4X,7G18.7))          STAR0260
      END                                                              STAR0261

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      SUBROUTINE STLJES (X,X1,DTX,NPASSX,XC,X1L)                       STLJ0001
      IF(NPASSX)20,10,20                                               STLJ0002
   10 X1L=X1                                                           STLJ0003
      XC=X                                                             STLJ0004
      NPASSX=1                                                         STLJ0005
      GOTO 30                                                          STLJ0006
   20 XC=XC+DTX*(X1+X1L)/2.                                            STLJ0007
   30 X=XC+DTX*(3.*X1-X1L)/2.                                          STLJ0008
      X1L=X1                                                           STLJ0009
      RETURN                                                           STLJ0010
      END                                                              STLJ0011

*****************************************************************************

      SUBROUTINE TIMEX (TUSED,DTIME,TLEFT)                             TIME0001
      REAL NEW,NOW                                                     TIME0002
      DATA NOW/0./                                                     TIME0003
      NEW=SECOND(T)                                                    TIME0004
      TUSED=NEW/60.                                                    TIME0005
      DTIME=(NEW-NOW)/60.                                              TIME0006
      NOW=NEW                                                          TIME0007
      TLEFT=10.-TUSED                                                  TIME0008
      RETURN                                                           TIME0009
      END                                                              TIME0010

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      SUBROUTINE TINIT                                                 TINI0001
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      COMMON /STRIMA/ AY,VH,T1(2),XXD,YYD,ZZD,T2,APFP,AYFP,T3(167),      TINI0002
     1                FTKTS,T4(2),TSTAB(14),T5(2),ASECOL                  TINI0003
      COMMON /STAMAN/ T6(5),ARBG,ASEP,T7(4),R550,AYDMX,T8(3),HGUST,      TINI0004
     1                KTCTR,T9(2),VGUST,ISTOP,T10(2),YGUST                TINI0005
      ARBG=0.                                                            TINI0006
      ASECOL=0.                                                          TINI0007
      AYDMX=0.                                                           TINI0008
      HGUST=0.                                                           TINI0009
      ISTOP=0                                                            TINI0010
      VGUST=0.                                                           TINI0011
      ASEP=0.                                                            TINI0012
      KTCTR  =  0                                                        TINI0013
      FTKTS=.5925                                                        TINI0014
      R550=.1818181818E-02                                               TINI0015
      YGUST=0.                                                           TINI0016
      VH=SQRT(XXD**2+YYD**2)                                             TINI0017
      AYFP=0.                                                            TINI0018
      APFP=0.                                                            TINI0019
      IF(VH.NE.0.) AYFP=ATAN2(YYD,XXD)                                   TINI0020
      IF(VH.NE.0..OR.ZZD.NE.0.) APFP=ATAN2(-ZZD,VH)                      TINI0021
      DO 10 I=2,14                                                       TINI0022
      IF(TSTAB(I).EQ.0.) TSTAB(I)=9999.                                  TINI0023
   10 CONTINUE                                                           TINI0024
      RETURN                                                             TINI0025
      END                                                                TINI0026

C*****************************************************************************

      SUBROUTINE TRIM                                                    TRIM0001
      COMMON /FORCE/  T1(20),YFFIN,T2(5),ZFELE                           TRIM0002
      COMMON /STRIAB/ T3(80),X(6),DL,DM,DN,DX,DY,DZ,T4(3),PD(6,7),       TRIM0003
     1                T5(145),XIT(21),T6(98),EPDX(11),MASS,T7(79),AYEFP,TRIM0004
     2                T8(3),PDPHI(6,7),T13,TZERO                         TRIM0005
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,     TRIM0006
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),     TRIM0007
     2                TIME,T9(151),ZDELT1                                TRIM0008
      COMMON /MANAL/  T10(5),TAXL,TAXR,T11(17),RANGE                     TRIM0009
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,TRIM0010
     1                YGUSTF,GFWD,GLAT,GVERT,VXH,VZH,APD,VYH,ARD,AYD,    TRIM0011
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE             TRIM0012
      COMMON /STANRO/ J,W,LINK,QELE,VSND,YFIN(2),ZFEL(2),COND1,SWING,    TRIM0013
     1                PILGH2,PWGEL1                                      TRIM0014
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                    TRIM0015
     1                NPART,NVARA,NVARB,NVARC,NSCALE                     TRIM0016
      COMMON /FORY/   Y(4,150)                                           TRIM0017
      COMMON /LJFTS/  T12(31),CONLJ(2,5)                                 TRIM0018
      DIMENSION VAR(11),HEAD2(2,11)                                      TRIM0019
      EQUIVALENCE (VAR(1),COLSTK)                                        TRIM0020
      LOGICAL AYEFP                                                      TRIM0021
      REAL MASS,IXZ                                                      TRIM0022
      DATA HEAD2/                                                        TRIM0023
     1 1H ,10H  THROTTLE,1H ,10HLONG STICK,1H ,10H LAT STICK,1H ,        TRIM0024
     2 10H     PEDAL,10H POS EXCEE,10HDS STOPS (,10H PERCENT F,         TRIM0025
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     3 10HULL THROW ,10HCOMPUTED) ,2*1H ,10HL THROT 1 ,1H ,                TRIM0026
     4 10HL THROT 2 ,1H ,9HL ANGLE 1,1H ,9HL ANGLE 2/                     TRIM0027
      DATA P01DTR/.1745329E-03/                                           TRIM0028
      AYEFP=.TRUE.                                                        TRIM0029
      IF(ABS(AYE-AYEFP).LE..01.AND.Y(1,85).EQ.0.) AYEFP=.FALSE.           TRIM0030
      LPASS=5                                                             TRIM0031
      IF(XIT(3).EQ.0.) LPASS=1                                            TRIM0032
      EPDX(1)=1./RANGE                                                    TRIM0033
      EPDX(2)=1./CYCF(3)                                                  TRIM0034
      EPDX(3)=1./CYCL(3)                                                  TRIM0035
      EPDX(4)=1./PEDA(3)                                                  TRIM0036
      DO 10 I=5,11                                                        TRIM0037
   10 EPDX(I)=1.                                                          TRIM0038
      IF (CONLJ(1,1).NE.0.) EPDX(8)=1./(CONLJ(1,1)*P01DTR)                TRIM0039
      IF (CONLJ(2,1).NE.0.) EPDX(9)=1./(CONLJ(2,1)*P01DTR)                TRIM0040
      IF (CONLJ(1,2).NE.0.) EPDX(10)=1./(CONLJ(1,2)*P01DTR)               TRIM0041
      IF (CONLJ(2,2).NE.0.) EPDX(11)=1./(CONLJ(2,2)*P01DTR)               TRIM0042
C                        EPDx IS IN UNITS OF PERCENT PER RADIAN            TRIM0043
      DX=0.                                                               TRIM0044
      DY=0.                                                               TRIM0045
      DZ=0.                                                               TRIM0046
      DL=0.                                                               TRIM0047
      DM=0.                                                               TRIM0048
      DN=0.                                                               TRIM0049
      DO 20 I=5,7                                                         TRIM0050
      EPDX(I)=1.                                                          TRIM0051
   20 CONTINUE                                                            TRIM0052
      CALL DAMPER                                                         TRIM0053
      DO 30 K=1,6                                                         TRIM0054
      X(K)=0.                                                             TRIM0055
      DO 30 L=1,7                                                         TRIM0056
      PD(K,L)=0.                                                          TRIM0057
      PDPHI(K,L)=0.                                                       TRIM0058
   30 CONTINUE                                                            TRIM0059
      LINK=2                                                              TRIM0060
      CALL ITRIM(LPASS)                                                   TRIM0061
      DO 40 I=1,11                                                        TRIM0062
      IF(I.GT.4.AND.I.LT.8) GO TO 40                                      TRIM0063
      IF(VAR(I).GE.0.0.AND.VAR(I).LE.100.) GO TO 40                       TRIM0064
      WRITE (6,50) (HEAD2(J,I),J=1,2),(HEAD2(J,5),J=1,2),                 TRIM0065
     1      VAR(I),(HEAD2(J,6),J=1,2),(HEAD2(J,7),J=1,2)                  TRIM0066
   40 CONTINUE                                                            TRIM0067
      DL=0.                                                               TRIM0068
      DM=0.                                                               TRIM0069
      DN=0.                                                               TRIM0070
      DX=0.                                                               TRIM0071
      DY=0.                                                               TRIM0072
      DZ=0.                                                               TRIM0073
      Y(1, 1)=VXA                                                         TRIM0074
      Y(1, 2)=VYA                                                         TRIM0075
      Y(1, 3)=VZA                                                         TRIM0076
      Y(1,4)=AYD                                                          TRIM0077
      Y(1,5)=APD                                                          TRIM0078
      Y(1,6)=APD                                                          TRIM0079
      Y(1,10)=AYE                                                         TRIM0080
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      Y(1,11)=APE                                                       TRIM0081
      Y(1,12)=ARE                                                       TRIM0082
      DIST= TZERO*V                                                     TRIM0083
      AY=0.                                                             TRIM0084
      IF(VXB.NE.0.0.OR .VYB.NE.0.) AY=ATAN2(-VYB,VXB)                   TRIM0085
      IF(KPART.NE.2.OR.EXIT.NE.0.) RETURN                               TRIM0086
      IND=0                                                             TRIM0087
      TDELT=ZDELT1                                                      TRIM0088
      TIME=TZERO-.95*TDELT                                              TRIM0089
      CALL IVAR (EXIT,LINK,TAXL,TAXR,PILGH2)                            TRIM0090
      CALL CONTRL(2)                                                    TRIM0091
      ZFEL(1)=ZFFLE                                                     TRIM0092
      YFIN(1)=YFFIN                                                     TRIM0093
      REWIND 3                                                          TRIM0094
      RETURN                                                            TRIM0095
   50 FORMAT (1H0,4A10,F7.1,4A10)                                       TRIM0096
      END                                                               TRIM0097

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      SUBROUTINE TURN (XFC,V,ARE)                                       TURN0001
      COMMON /FORY/    Y(4,150)                                         TURN0002
      DIMENSION XFC(28)                                                 TURN0003
      DATA G/32.17/,DTR/.1745329E-01/                                   TURN0004
      Y(2,66)=1.                                                        TURN0005
      IF(XFC(21).NE.0.) GO TO 60                                        TURN0006
      DO 10 I=12,14                                                     TURN0007
      IF(XFC(I).EQ.0.) GO TO 10                                         TURN0008
      J=I-11                                                            TURN0009
      GO TO (20,30,40),J                                                TURN0010
   10 CONTINUE                                                          TURN0011
      RETURN                                                            TURN0012
   20 CONTINUE                                                          TURN0013
      GLEVEL=XFC(12)                                                    TURN0014
      IF(GLEVEL.LE.1.) GO TO 60                                         TURN0015
      ARE= ACOS(1./GLEVEL)                                              TURN0016
      ARED=ARE/DTR                                                      TURN0017
      TRAD=V**2/(G*TAN(ARE))                                            TURN0018
      GO TO 50                                                          TURN0019
   30 CONTINUE                                                          TURN0020
      ARED=XFC(13)                                                      TURN0021
      ARE=ARED*DTR                                                      TURN0022
      GLEVEL=1./COS(ARE)                                                TURN0023
      TRAD=V**2/(G*TAN(ARE))                                            TURN0024
      GO TO 50                                                          TURN0025
   40 CONTINUE                                                          TURN0026
      TRAD=XFC(14)                                                      TURN0027
      ARE=ATAN2(V**2,G*TRAD)                                            TURN0028
      ARED=ARE/DTR                                                      TURN0029
      GLEVEL=1./COS(ARE)                                                TURN0030
   50 CONTINUE                                                          TURN0031
      Y(1,85)=V/TRAD                                                    TURN0032
      PSID=Y(1,85)/DTR                                                  TURN0033
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      TURNT=360./ABS(PSID)                                                  TURN0034
      TRAD=ABS(TRAD)                                                        TURN0035
      WRITE (6,100) GLEVEL,ARED,TRAD,PSID,TURNT                             TURN0036
      RETURN                                                                TURN0037
   60 CONTINUE                                                              TURN0038
      Y(2,85)=XFC(12)                                                       TURN0039
      IF(XFC(12)-1.) 70,80,90                                               TURN0040
   70 CONTINUE                                                              TURN0041
      WRITE (6,110) XFC(12)                                                 TURN0042
   80 CONTINUE                                                              TURN0043
      RETURN                                                                TURN0044
   90 WRITE (6,120) XFC(12)                                                 TURN0045
      RETURN                                                                TURN0046
  100 FORMAT(//15H G-LEVEL      = G12.5,10X,14H BANK ANGLE = G12.5//,       TURN0047
     1          15H TURN RADIUS = G12.5,10X,14H YAW RATE   = G12.5//,      TURN0048
     2          41H TIME USED TO COMPLETE 360 DEGREE TURN = G12.5)         TURN0049
  110 FORMAT(//24H PUSH-OVER WITH G-LEVEL = G12.5)                          TURN0050
  120 FORMAT(//24H PULL-UP WITH G-LEVEL = G12.5)                            TURN0051
      END                                                                   TURN0052
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      SUBROUTINE VARI                                                       VARI0001
      COMMON /FORCE/  XF,XFRWG,XFLWG,XFELE,XFFUS,XFRJET,XFLJET,XFRJ,        VARI0002
     1                XFLJ,XFGUN,XFFIN,XFW,XADD,                            VARI0003
     2                YF,YFFUS,YFRJET,YFLJET,YFRJ,YFLJ,YFGUN,YFFIN,YFW,     VARI0004
     D                YADD,                                                 VARI0005
     3                ZF,ZFRWG,ZFLWG,ZFELE,ZFFUS,ZFRJET,ZFLJET,ZFRJ,        VARI0006
     4                ZFLJ,ZFGUN,ZFW,ZADD,                                  VARI0007
     5                QL,LRWG,LLWG,LELE,LFUS,LRJET,LLJET,RMRJ,RMLJ,LGUN,    VARI0008
     A                LFIN,RGYRO,RMADD,                                     VARI0009
     6                QM,MRWG,MLWG,MELE,MFUS,MRJET,MLJET,PMRJ,PMLJ,MGUN,    VARI0010
     B                MFIN,PGYRO,PMADD,                                     VARI0011
     7                QN,NRWG,NLWG,NELE,NFUS,NRJET,NLJET,YMRJ,YMLJ,NGUN,    VARI0012
     C                NFIN,YGYRO,YMADD                                      VARI0013
      COMMON /STRIAB/ E(74),F(6),X(6),DL,DM,DN,DX,DY,DZ,IX,IY,IZ,           VARI0014
     1                PD(6,7),DTR,EPD,ERR(6),KM1,RH[illegible],RI2,SPD(6,6,1),VARI0015
     2                XEL(14),XER(7),XFC(28),XFN(7),XFS(35),XGN(7),         VARI0016
     3                XIT(21),XWG(21),YWG(21),YEL(21),YFN(21),BLCG,         VARI0017
     4                DAMP,DEPD(11),EPDS,EPDX(11),MASS,WLCG,XCON(63),       VARI0018
     5                XJET(14),XMIN,AYEFP,CNPCD,GUESS,NPASS,PDPHI(6,7),     VARI0019
     6                STACG,TZERO,DTRHSQ,MXPASS,XLIMIT,XRJT(140),YRJT(7)    VARI0020
     7               ,XLJT(84),YLJT(7)                                      VARI0021
      COMMON /STRIMA/ AY,VH,AGW,IXZ,XXD,YYD,ZZD,ALGF,APFP,AYFP,CGWL,        VARI0022
     1                COLL(6),CYCF(3),CYCL(3),DIST,KCIT(20),PEDA(3),        VARI0023
     2                TIME,TMAX,XCIT(20,6),ALGE7,ALGE1,ALGE2,CGSTA,         VARI0024
     3                CPWIC,DIXIZ,DIYIX,DIZIY,FTKTS,KREAD,PIU30,            VARI0025
     4                TSTAR(14),ZMAX2,ZMAX3,ASECOL,CYPWIC,RUDIND,           VARI0026
     5                ZDELT1,ZDELT2                                         VARI0027
      COMMON /STAMAN/ XX,YY,AYI,RIY,APBG,ARBG,ASEP,AYHG,CGBL,DPIX,DPIZ,     VARI0028
     1                R550,AYDMX,DELT2,DPIXZ,HDELT,HGUST,KTCTR,RMASS,       VARI0029
     2                TWOPI,VGUST,ISTOP,XAGUN,YAGUN,YGUST,ZAGUN,DELT2R,     VARI0030
     3                P01DTR,RDELT1,RDELT2                                  VARI0031
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      COMMON /MANAL/  Q,AP,PED,QWG,ALEL,TAXL,TAXR,XAWG,ZAWG,ALCYP,      VARI0032
     1                ALFIN,ALLWG,ALRWG,CDELE,CDFIN,CDLWG,CDRWG,CLELE,  VARI0033
     2                CLFIN,CLLWG,CLRWG,CWING,CYCR1,CYCR2,RANGE,WGCOL,  VARI0034
     3                XAELE,XAFIN,XAFUS,XAJET,YAFIN,ZAELE,ZAFIN,ZAFUS,  VARI0035
     4                YAELE,YAFUS,YALWG,YARWG,YALJET,YARJET,ZAJET,      VARI0036
     5                ALECR1,ALGFPD,HALFPI,YGUSTW,ZFLWG1,ZFRWG1         VARI0037
      COMMON /ROMAN/  PI,ZZ,ALT,T,APDD,AHDD,AYDD,DTRR,GMAXV,RATE1,     VARI0038
     1                RATE2,STOP2,XGUST,GMAXV1,GMAXV2,GMAXV3,GUSTYP,    VARI0039
     2                LNGTH1,PILGH1,START2,DDA1,DDA2,DDA3               VARI0040
      COMMON /MANARD/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,VARI0041
     1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZH,ARD,VYB,ARD,AYD,   VARI0042
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE            VARI0043
     3               ,TLSTK(2),THLSTK(2),AT,BT,CT,ATH,BTH,CTH           VARI0044
     4               ,DFLAP1,FAIL(6)                                    VARI0045
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                   VARI0046
     1                NPART,NVARA,NVARB,NVARC,NSCALE                    VARI0047
     1                ,NVARS,NPRINT,NTIME                               VARI0048
      COMMON /FORY/   Y(4,150)                                          VARI0049
      COMMON /RJETS/  NJETR,XSTK(3),X0(10),XD(10),XR(10),TPOS(10),      VARI0050
     1                TNEG(10),XAJETR(10),YAJETR(10),ZAJETR(10),        VARI0051
     2                AYBJTR(10),APBJTR(10),JTRCON(10)                  VARI0052
      REAL LGUN,MGUN,NGUN                                               VARI0053
      DIMENSION TAX(2)                                                  VARI0054
      EQUIVALENCE (TAX(1),TAXL)                                         VARI0055
      XDELIM(X1,X2,X3)=AMAX1(X1,AMIN1(X2,X3))                           VARI0056
   10 DO 230 L=1,KREAD                                                  VARI0057
      J=KCIT(L)                                                         VARI0058
      IF(J.EQ.31) GO TO 210                                             VARI0059
      IF(J.GT.23) GO TO 230                                             VARI0060
      IF(J.LT.9.OR.J.GT.12) GO TO 20                                    VARI0061
      CALL GUST (J)                                                     VARI0062
      GO TO 230                                                         VARI0063
   20 CONTINUE                                                          VARI0064
      IF(TIME.LT.XCIT(L,1)) GO TO 230                                   VARI0065
      IF(J.GT.12) GO TO 110                                             VARI0066
      RATE=XCIT(L,2)                                                    VARI0067
      IF(TIME.GT.XCIT(L,3)) RATE=0.                                     VARI0068
      IF(TIME.GE.XCIT(L,4))RATE      =+XCIT(L,5)                        VARI0069
      IF(TIME.GT.XCIT(L,6)) RATE=0.                                     VARI0070
      DA=RATE*HDELT                                                     VARI0071
      IF(RATE.EQ.0.) GO TO 230                                          VARI0072
      GO TO (30,40,50,60,70,80,90,100),J                                VARI0073
   30 CONTINUE                                                          VARI0074
      COLSTK=XDELIM(0.,100.,COLSTK+DA)                                  VARI0075
      WGCOL=AGW                                                         VARI0076
      GO TO 230                                                         VARI0077
   40 CONTINUE                                                          VARI0078
      CYSTK1=XDELIM(0.,100.,CYSTK1+DA)                                  VARI0079
      CYCR1=CYSTK1*CYCF(3)+CYCF(2)                                      VARI0080
      ALGE3=XCON(26)/(2.*DTRR)                                          VARI0081
      XSTK(1)=CYCR1*DTRR                                                VARI0082
      GO TO 230                                                         VARI0083
   50 CONTINUE                                                          VARI0084
      CYSTK2=XDELIM(0.,100.,CYSTK2+DA)                                  VARI0085
      CYCR2=CYSTK2*CYCL(3)+CYCL(2)                                      VARI0086
```

```
      XSTK(2)=CYCR2*DTRR                                                    VARI0087
      GO TO 230                                                             VARI0088
   60 CONTINUE                                                              VARI0089
      PEDAL=XDELIM(0.,100.,PEDAL+DA)                                        VARI0090
      PED=PEDAL*PEDA(3)+PEDA(2)                                             VARI0091
      XSTK(3)=PED*PEDA(1)/(PEDA(3)*100.)                                    VARI0092
      GO TO 230                                                             VARI0093
   70 CONTINUE                                                              VARI0094
      TLSTK(1)=XDELIM(0.,100.,TLSTK(1)+DA)                                  VARI0095
      IF(AT .NE.0..OR.BT .NE.0..OR.CT .NE.0.)  TLSTK(2)=AT +(BT +           VARI0096
     1                                        CT * TLSTK(1))* TLSTK(1)      VARI0097
      GO TO 230                                                             VARI0098
   80 CONTINUE                                                              VARI0099
      TLSTK(2)=XDELIM(0.,100.,TLSTK(2)+DA)                                  VARI0100
      GO TO 230                                                             VARI0101
   90 CONTINUE                                                              VARI0102
      THLSTK(1)=XDELIM(0.,100.,THLSTK(1)+DA)                                VARI0103
      IF(ATH.NE.0..OR.BTH.NE.0..OR.CTH.NE.0.) THLSTK(2)=ATH+(BTH+           VARI0104
     1                                        CTH*THLSTK(1))*THLSTK(1)      VARI0105
      GO TO 230                                                             VARI0106
  100 CONTINUE                                                              VARI0107
      THLSTK(2)=XDELIM(0.,100.,THLSTK(2)+DA)                                VARI0108
      GO TO 230                                                             VARI0109
  110 CONTINUE                                                              VARI0110
      K=J-12                                                                VARI0111
      GO TO (120,130,150,230,170,180,190,200,230,230,230),K                 VARI0112
  120 FRATE=0.                                                              VARI0113
      IF((TIME.GT.XCIT(L,1)).AND.(TIME.LT.XCIT(L,3))) FRATE=XCIT(L,2)       VARI0114
      IF((TIME.GT.XCIT(L,4)).AND.(TIME.LT.XCIT(L,6))) FRATE=XCIT(L,5)       VARI0115
      DFLAP1=DFLAP1+FRATE*HDELT                                             VARI0116
      GOTO 230                                                              VARI0117
  130 IF(TIME.LT.XCIT(L,1)) GO TO 230                                       VARI0118
      DA=XCIT(L,3)*HDELT                                                    VARI0119
      N=XCIT(L,6)+.01                                                       VARI0120
      IF(XCIT(L,2).EQ.0.) GO TO 160                                         VARI0121
      TAX(N)=TAX(N)+DA                                                      VARI0122
      IF(SIGN(1.,DA).EQ.SIGN(1.,(XCIT(L,5)-TAX(N)))) GO TO 230              VARI0123
      TAX(N)=XCIT(L,5)                                                      VARI0124
  140 XCIT(L,1)=9999.                                                       VARI0125
      GO TO 230                                                             VARI0126
  150 IF(TIME.LT.XCIT(L,1)) GOTO 230                                        VARI0127
      DA=1./(XCIT(L,2)-XCIT(L,1))                                           VARI0128
      N=XCIT(L,3)+.01                                                       VARI0129
      FAIL(N)=FAIL(N)-DA*HDELT                                              VARI0130
      IF(TIME.GT.XCIT(L,2)) FAIL(N)=0.                                      VARI0131
      GOTO230                                                               VARI0132
  160 IF(TIME.GE.XCIT(L,4)) GO TO 140                                       VARI0133
      TAX(N)=TAX(N)+DA                                                      VARI0134
      GO TO 230                                                             VARI0135
  170 IF(XCIT(L,3).LT.TIME) GOTO 230                                        VARI0136
      T2=XCIT(L,4)/HDELT                                                    VARI0137
      IF(T2.EQ.0.) T2=1.                                                    VARI0138
      DA=(XCIT(L,2)*AYD-DDA3)/T2                                            VARI0139
      DDA3=DDA3+DA                                                          VARI0140
      IF((PEDAL+DA).LT.0.) DDA3=DDA3-PEDAL-DA                               VARI0141
```

```
      IF((PEDAL+DA).GT.100.) DDA3=DDA3-PEDAL-DA+100.                    VARI0142
      GOTO 60                                                           VARI0143
  180 IF(XCIT(L,4).LT.TIME) GOTO 230                                    VARI0144
      T2=XCIT(L,5)/HDELT                                                VARI0145
      IF(T2.EQ.0.) T2=1.                                                VARI0146
      DA=(-(XCIT(L,3)*ARD+XCIT(L,2)*ARE)-DDA2)/T2                       VARI0147
      DDA2=DDA2+DA                                                      VARI0148
      IF((CYSTK2+DA).LT.0.) DDA2=DDA2-CYSTK2-DA                         VARI0149
      IF((CYSTK2+DA).GT.100.) DDA2=DDA2-CYSTK2-DA+100.                  VARI0150
      GOTO 50                                                           VARI0151
  190 IF(XCIT(L,5).LT.TIME) GOTO 230                                    VARI0152
      T2=XCIT(L,6)/HDELT                                                VARI0153
      IF(T2.EQ.0.) T2=1.                                                VARI0154
      DA=(XCIT(L,3)*APD+XCIT(L,2)*(APE-XCIT(L,4))-DDA1)/T2              VARI0155
      DDA1=DDA1+DA                                                      VARI0156
      IF((CYSTK1+DA).LT.0.) DDA1=DDA1-CYSTK1-DA                         VARI0157
      IF((CYSTK1+DA).GT.100.) DDA1=DDA1-CYSTK1-DA+100.                  VARI0158
      GO TO 40                                                          VARI0159
  200 IF(TIME.GT.XCIT(L,4)) GO TO 230                                   VARI0160
      OT1=XCIT(L,2)*(T-XCIT(L,1))                                       VARI0161
      OT2=XCIT(L,2)*(T+TDELT-XCIT(L,1))                                 VARI0162
      RATE=XCIT(L,3)*RDELT1/XCIT(L,2)*(SIN(OT2)-SIN(OT1))               VARI0163
      DA=RATE*HDELT                                                     VARI0164
      K=XCIT(L,5)+.1                                                    VARI0165
      GO TO (30,40,50,60,70,80,90,100),K                                VARI0166
  210 CONTINUE                                                          VARI0167
      DO 220 K=1,5,2                                                    VARI0168
      IF(TIME.GE.XCIT(L,K)) NPRINT=XCIT(L,K+1)                          VARI0169
  220 CONTINUE                                                          VARI0170
      IF(NPRINT.LE.0) NPRINT=1                                          VARI0171
      GO TO 230                                                         VARI0172
  230 CONTINUE                                                          VARI0173
      RETURN                                                            VARI0174
      END                                                               VARI0175

*****************************************************************************

      SUBROUTINE VR2D (X ,Y ,A,X2,Y2,N1)                                VR2D0001
C         TWO DIMENSIONAL VECTOR TRANSFORMATION                         VR2D0002
C         N1=1 IS FOR USUAL                                             VR2D0003
      X1=X                                                              VR2D0004
      Y1=Y                                                              VR2D0004
C         N1=-1 IS FOR INVERSE                                          VR2D0004
      S=SIN(A)*N1                                                       VR2D0005
      C=COS(A)                                                          VR2D0006
      X2=X1*C-Y1*S                                                      VR2D0007
      Y2=X1*S+Y1*C                                                      VR2D0008
      RETURN                                                            VR2D0009
      END                                                               VR2D0010
```

```
      SUBROUTINE VR3D (X1,Y1,Z1,A1,A2,A3,X2,Y2,Z2,N1)                    VR3D0001
      DIMENSION A(9)                                                     VR3D0002
C          THREE DIMENSIONAL VECTOR TRANSFORMATION                       VR3D0003
C          N1=1 FOR USUAL                                                VR3D0004
C          N1=-1 FOR INVERSE                                             VR3D0005
      CALL MATRIX (A1,A2,A3,A,N1)                                        VR3D0006
      X2=X1*A(1)+Y1*A(2)+Z1*A(3)                                         VR3D0007
      Y2=X1*A(4)+Y1*A(5)+Z1*A(6)                                         VR3D0008
      Z2=X1*A(7)+Y1*A(8)+Z1*A(9)                                         VR3D0009
      RETURN                                                             VR3D0010
      END                                                                VR3D0011
```

```
      SUBROUTINE WRFM                                                    WRFM0001
      COMMON /FORCE/ A1(74)                                              WRFM0002
      DIMENSION A(74)                                                    WRFM0003
      DO 10 I=1,35                                                       WRFM0004
   10 A(I)=A1(I)*4.4482                                                  WRFM0005
      DO 20 I=36,74                                                      WRFM0006
   20 A(I)=A1(I)*1.3558                                                  WRFM0007
      WRITE (6,30) A                                                     WRFM0008
      RETURN                                                             WRFM0009
   30 FORMAT (1H0,54X,24HFORCE AND MOMENT SUMMARY,//                     WRFM0010
     1        1H ,15X,41HTOTAL   R.WING   L.WING     HSTAB     FUS,4X,  WRFM0011
     2        50HR*FIXED JETS*L   R/JETS   L/JETS     INLET   VSTAB,    WRFM0012
     3        1X,17H  W/GYRO   P.I.E.,//                                 WRFM0013
     4        12H  X-FORCE    ,13F9.1/                                   WRFM0014
     5        12H  Y-FORCE    ,F9.1,27X,9F9.1/                           WRFM0015
     6        12H  Z-FORCE    ,10F9.1,9X,2F9.1/                          WRFM0016
     7        12H  ROLL       ,13F9.1/                                   WRFM0017
     8        12H  PITCH      ,13F9.1/                                   WRFM0018
     9        12H  YAW        ,13F9.1/)                                  WRFM0019
      END                                                                WRFM0020
```

```
      SUBROUTINE WROT1                                                   WROT0001
      COMMON /TOPLOT/ AH(3),AL(3),EXIT,ICOM(20),IPSN,                    WROT0002
     1                NPART,NVARA,NVARB,NVARC,NSCALE                     WROT0003
     1                ,NVARS,NPRINT,NTIME                                WROT0004
      CALL DATE (NDATE)                                                  WROT0005
      RETURN                                                             WROT0006
      ENTRY WROT                                                         WROT0007
      WRITE (6,10) NDATE,NPART,IPSN,ICOM                                 WROT0008
      RETURN                                                             WROT0009
   10 FORMAT                                                             WROT0010
     1       (1H1,48X,40HV/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM/       WROT0011
     2        55X,28HNAVAL AIR DEVELOPMENT CENTER/                       WROT0012
     3        58X,18HCOMPILED JULY 1976/                                 WROT0013
     4        57X,10HCOMPUTED  ,A10//                                    WROT0014
```

```
     4       1H0,18X,I4,4X,I9,5X,6A10/1H ,32X,7A10,/1H ,32X,7A10)          WROT0015
      END                                                                  WROT0016

*****************************************************************************

      SUBROUTINE WRVP (NVAR,KM1,PD,TAXL,TAXR)                              WRVP0001
C     THE ACTION TAKEN IN THIS SUBROUTINE DEPENDS ENTIRELY UPON N:         WRVP0002
C         IF N=1 - WRITE VARIABLES INDICATED IN TRIM AND STAB AND ROTOR    WRVP0003
C                  DATA ONLY                                               WRVP0004
C         IF N=2 - WRITE PARTIAL DERIVATIVES ONLY                          WRVP0005
C         IF N=3 - DO BOTH                                                 WRVP0006
      COMMON /MANARO/ I,V,NWAG,TDELT,HGUSTE,HGUSTF,HGUSTW,VGUSTE,VGUSTW,  WRVP0007
     1                YGUSTF,GFWD,GLAT,GVERT,VXB,VZB,APD,VYB,ARD,AYD,     WRVP0008
     2                COLSTK,CYSTK1,CYSTK2,PEDAL,AYE,APE,ARE              WRVP0009
      COMMON /KVARTR/ KVAR(6),PD1                                          WRVP0010
C         N DETERMINES WHICH TYPE OF OUTPUT                                WRVP0011
C         KM1  = RANK OF PARTIAL DERIVATIVE MATRIX                         WRVP0012
      DIMENSION VAR(11),PD(6,7),HEAD(18)  ,VARD(11)                        WRVP0013
      DIMENSION PD1(6,12)                                                  WRVP0014
      DATA DTRR/ 57.2957795/                                               WRVP0015
      DATA HEAD/                                                           WRVP0016
     1 7HX-FORCE,7HY-FORCE,7HZ-FORCE,7HYAW MOM,9HPITCH MOM,8HROLL MOM,     WRVP0017
     2 8HTHROTTLE,8HLONG STK,7HLAT STK,5HPEDAL,3HYAW,5HPITCH,4HROLL,       WRVP0018
     3 9HL THROT 1,9HL THROT 2,9HL ANGLE 1,9HL ANGLE 2,6H-ERROR/           WRVP0019
      IF(N.EQ.2) GO TO 20                                                  WRVP0020
      DO 10 L=1,11                                                         WRVP0021
      DA=1.                                                                WRVP0022
      IF(L.GT.4.AND.L.LT.8) DA=DTRR                                        WRVP0023
      VARD(L)=VAR(L)*DA                                                    WRVP0024
   10 CONTINUE                                                             WRVP0025
      WRITE (6,50) (VARD(KVAR(L)),L=1,KM1)                                 WRVP0026
      IF(N.EQ.1) RETURN                                                    WRVP0027
   20 WRITE(6,60) (HEAD(J),J=1,KM1)                                        WRVP0028
      DO 30 J=1,KM1                                                        WRVP0029
      WRITE(6,70) HEAD(KVAR(J)+6),(PD(I,J),I=1,KM1)                        WRVP0030
   30 CONTINUE                                                             WRVP0031
      WRITE(6,70) HEAD(18),(PD(I,KM1+1),I=1,KM1)                           WRVP0032
      RETURN                                                               WRVP0033
      ENTRY WRVP1                                                          WRVP0034
      WRITE(6,60) (HEAD(J),J=1,6)                                          WRVP0035
      DO 40 J=1,11                                                         WRVP0036
      WRITE(6,70) HEAD(J+6),(PD1(I,J),I=1,6)                               WRVP0037
   40 CONTINUE                                                             WRVP0038
      RETURN                                                               WRVP0039
   50 FORMAT (1H0,11X,10HVAR(I)     ,10F10.5)                             WRVP0040
   60 FORMAT (1H0,53X,25HPARTIAL DERIVATIVE MATRIX/1H0,11X,10(2X,A10)/)    WRVP0041
   70 FORMAT (1H ,A10,2X,10G12.5)                                          WRVP0042
      END                                                                  WRVP0043

*****************************************************************************

      SUBROUTINE XPRO (RX,RY,RZ,FX,FY,FZ,ROLL,PITCH,YAW)                   XPRO0001
```

```
C          COMPUTE VECTOR CROSS PRODUCT  L = R X F                                XPRO0002
      ROLL=RY*FZ-RZ*FY                                                            XPRO0003
      PITCH=RZ*FX-RX*FZ                                                           XPRO0004
      YAW=RX*FY-RY*FX                                                             XPRO0005
      RETURN                                                                      XPRO0006
      END                                                                         XPRO0007

*****************************************************************************

      SUBROUTINE YFIX (YIN,YAERO)                                                 YFIX0001
      COMMON /STRIAB/ ADUM(184),XEL(14),BDUM(35),XFN(7),CDUM(63),XWG(21)          YFIX0002
      DIMENSION HEAD(5),YIN(21,3),YAERO(31,3)                                     YFIX0003
      DIMENSION S(3)                                                              YFIX0004
      DATA HEAD/                                                                  YFIX0005
     1 4HWING,3HFLE,3HFIN,6HNORMAL,4HREVERSED/                                    YFIX0006
      DATA DTRR,PI,DTRRSQ /57.29578,3.14159,3282.806/                             YFIX0007
      DO 20 I=1,18                                                                YFIX0008
      DD=1.                                                                       YFIX0009
      IF(I.LE.2.OR.I.EQ.6) DD=1./DTRR                                             YFIX0010
      IF(I.EQ.13.OR.I.EQ.17) DD=DTRR                                              YFIX0011
      IF(I.EQ.14) DD=DTRRSQ                                                       YFIX0012
      DO 10 J=1,3                                                                 YFIX0013
      YAERO(I,J)=YIN(I,J)*DD                                                      YFIX0014
   10 CONTINUE                                                                    YFIX0015
   20 CONTINUE                                                                    YFIX0016
      S(1)=XWG(1)                                                                 YFIX0017
      S(2)=XEL(1)                                                                 YFIX0018
      S(3)=XFN(1)                                                                 YFIX0019
      DO 40 I=1,3                                                                 YFIX0020
      IF(YAERO(17,I).EQ.0.) GO TO 40                                              YFIX0021
      TLH=TAN(YAERO(1,I))-1./YAERO(18,I)*(1.-YAERO(8,I))/(1.+YAERO(8,I))          YFIX0022
      CLAE=2.*PI*YAERO(16,I)/(2.+SQRT((2.*PI*YAERO(16,I)/YAERO(17,I))**2          YFIX0023
     1    *(1.+TLH**2)+4.))                                                       YFIX0024
      XKWB=.527*(1.+YAERO(5,I))**1.534+.473                                       YFIX0025
      YAERO(22,I)=XKWB*CLAE*YAERO(4,I)/S(I)                                       YFIX0026
      I1=-2                                                                       YFIX0027
      I2=-1                                                                       YFIX0028
      DO 30 IW=24,26,2                                                            YFIX0029
      I1=I1+4 $ I2=I2+4                                                           YFIX0030
      YAERO(IW,I)=(YAERO(I2,I)/COS(YAERO(I1,I))-YAERO(22,I)                       YFIX0031
     1    *SIN(2.*YAERO(I1,I)))/2.)/(SIN(YAERO(I1,I)))**2                         YFIX0032
   30 CONTINUE                                                                    YFIX0033
      ALMLE=ATAN(TAN(YAERO(1,I))+1./YAERO(18,I)*(1.-YAERO(8,I))                   YFIX0034
     1    /(1.+YAERO(8,I)))                                                       YFIX0035
      XL=YAERO(8,I)                                                               YFIX0036
      C1=4.47*XL**3-8.125*XL**2+3.712*XL-.029                                     YFIX0037
      C2=2.943*XL**3-7.208*XL**2+5.199*XL-.113                                    YFIX0038
      XJ=.3*(1.+C1)*YAERO(18,I)*COS(ALMLE)*((1.+C1)*(1.+C2)                       YFIX0039
     1    -((1.+C2)*YAERO(18,I)*TAN(ALMLE)/7.)**3)                                YFIX0040
      YAERO(23,I)=.22*XJ                                                          YFIX0041
      IF(XJ.GT.0.) YAERO(23,I)=SQRT(2.65*XJ)                                      YFIX0042
   40 CONTINUE                                                                    YFIX0043
      RETURN                                                                      YFIX0044
```

```
END                                                                    YFIX0045
```

A P P E N D I X B

SAMPLE PROGRAM INPUT AND OUTPUT

```
02  50                                                                  1
      1000          CHECK RUN FOR CDC PROGRAM VERSION                   2
                           XV-6A KESTREL DATA                           3
                            TRIM + STABILITY                            4
53378.6     571.78      0.        223.52    556.77    0.        251.03  5
5016.5      30370.3     32946.4   0.                                    6
2.          17.122      1.7583    0.1229              1.8519    17.893  7
1.7676      85.         9.585     .8046     -6.533    .3468     70.     8
8.104       .7983       -9.099    .6081     261.2     246.4     1780.   9
17.317      626.4       195.6     280.9     1.75                        10
            14.07                           .06       -.13      .23     11
-.211       0.          .055      -.03      -.42      -.14      18.     12
34.         23.         .87       12.272    .23       23.       .87     13
.4          .459        2.643     .00078    .0073                       14
-.0065      2.342       .106      2.797     .0058     .0026     -.0005  15
4.413       1120.1      0.        295.4                                 16
                                  0.                                    17
32.9        24.3        .98       3.90      .16       24.3      .98     18
.201        .222        1.180     0.        .0091                       19
0.          4.08        .109      4.277                                 20
3.32        1079.2      0.        400.6                                 21
40.2        33.4        1.08      2.40      .163      33.4      1.08    22
.23         .268        1.550     0.        .0099                       23
0.          2.45        .110      2.73                                  24
                                                                        25
                                                                        26
0.          0.          25.40     25.40     581.42    0.        3.74    27
                                                      1.        1.      28
1.          1.                                                          29
                                  30.48     15.24     0.591     0.853   30
20.828      -10.414     1.201     7.112     -15.      30.       0.      31
                                                                        32
                                                                        33
-.025       .0011944  -.00005278.000000201-.00001386.000008565-.0457    34
0.005207    .00001042                                                   35
20.         0.          0.        60.96     0.        5.        0.      36
0.          50.         50.       50.                                   37
80.         0.          90.       0.        50.                         38
                                                      340.16    1.      39
```

FIGURE B-1

```
88.96       88.96       88.96       54.23       54.23                                   40
20.         0.          0.          .2          1.0         .03                         41
                                                2.54        0.508       4067.5          42
2.          3.          4.          7.          8.          10.                         43
                                                                                        44
                                                                                        45
5.          0.          2.3929      -.011870    4.                                      46
35.56       0.          188.98      0.          97.63       1.          3.81            47
0.          9.40        0.          -3603.                                              48
1218.4      0.          301.2       0.          82.         1.          3.81            49
0.          9.65        6539.       0.                                                  50
1205.7      0.          301.2       90.         0.          3.          0.              51
0.          3.56        2224.       2224.                                               52
701.3       339.3       236.2        90.        75.         2.                          53
0.          9.40        0.          -3114.                                              54
701.3       -339.3      236.2       -90.        75.         2.                          55
0.          9.40        3114.       0.                                                  56
4.                                                                                      67
465.2       103.8       246.4       -90.        0.          -5.         1.              68
                                                                                        69
465.2       -103.8      246.4       -90.        0.           5.         1.              70
                                                                                        71
656.9       79.63       240.4       -90.        0.          -12.5       1.              72
                                                                                        73
656.9       -79.63      240.4       -90.        0.           12.5       1.              74
                                                                                        75
.909        .08         .667                                                            80
                                                                                        81
                                                                                        82
                                                                                        83
0.          .02         3.                                                              84
   20       0.          3.183       1.          5.          5.                          85
03   1   0  130         50.  100.    101        -10. 10.     118        0.    10.        1
11               3      3.183            1                   50                        1
  130  101  118                                                                         1A
    2  130  101  118                                                                    1B
```

FIGURE B-2

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
NAVAL AIR DEVELOPMENT CENTER
COMPILED JULY 1976
COMPUTED 09/13/76.

2 1000

CHECK RUN FOR CDC PROGRAM VERSION
XV-6A KESTREL DATA
TRIM + STABILITY

INPUT DATA

FUSELAGE GROUP

53378.60	571.7800	.0	223.5200	556.7700	.0	251.0300
5016.500	30370.30	32946.40	.0	-.0	-.0	-.0
2.000000	17.12200	1.758300	.1229000	-.0	1.851900	17.89300
1.767600	85.00000	9.585000	.8046000	-6.533000	.3468000	70.00000
8.104000	.7983000	-9.099000	.6081000	261.2000	246.4000	1780.000

WING GROUP

17.31700	626.4000	195.6000	280.9000	1.750000	-.0	-.0
-.0	14.07000	-.0	-.0	.6000000E-01	-.1300000	.2300000
-.2110000	.0	.5500000E-01	-.3000000E-01	-.4200000	-.1400000	18.00000
34.00000	23.00000	.8700000	12.27200	.2300000	23.00000	.8700000
.4000000	.4590000	2.643000	.7800000E-03	.7300000E-02	-.0	-.0
-.6500000E-02	2.342000	.1060000	2.797000	.5800000E-02	.2600000E-02	-.5000000E-03

ELEVATOR GROUP

4.413000	1120.100	.0	295.4000	-.0	-.0	-.0
-.0	-.0	-.0	.0	-.0	-.0	-.0
32.90000	24.30000	.9800000	3.900000	.1600000	24.30000	.9800000
.2010000	.2220000	1.180000	.0	.9100000E-02	-.0	-.0
.0	4.080000	.1090000	4.277000	-.0	-.0	-.0

FIN/RUDDER GROUP

3.320000	1079.200	.0	400.6000	-.0	-.0	-.0
40.20000	33.40000	1.080000	2.400000	.1630000	33.40000	1.080000
.2300000	.2680000	1.550000	.0	.9900000E-02	-.0	-.0
.0	2.450000	.1100000	2.730000	-.0	-.0	-.0

JET GROUP

-.0	-.0	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0

REACTION JET GROUP

5.000000	.0	2.392900	-.1187000E-01	4.000000	-.0	-.0
35.56000	.0	188.9800	.0	97.63000	1.000000	3.810000
.0	9.400000	.0	-3603.000	-.0	-.0	-.0
1218.400	.0	301.2000	.0	82.00000	1.000000	3.810000
.0	9.650000	6539.000	.0	-.0	-.0	-.0
1205.700	.0	301.2000	90.00000	.0	3.000000	.0
.0	3.560000	2224.000	2224.000	-.0	-.0	-.0
701.3000	339.3000	236.2000	90.00000	75.00000	2.000000	-.0
.0	9.400000	.0	-3114.000	-.0	-.0	-.0
701.3000	-339.3000	236.2000	-90.00000	75.00000	2.000000	-.0
.0	9.400000	3114.000	.0	-.0	-.0	-.0

LIFT JET GROUP

4.000000	-.0	-.0	-.0	-.0	-.0	-.0
465.2000	103.8000	246.4000	-90.00000	.0	-5.000000	1.000000

FIGURE B-3

-.0	-.0	-.0	-.0	-.0	-.0	-.0
465.2000	-103.8000	246.4000	-90.00000	.0	5.000000	1.000000
-.0	-.0	-.0	-.0	-.0	-.0	-.0
656.9000	79.63000	240.4000	-90.00000	.0	-12.50000	1.000000
-.0	-.0	-.0	-.0	-.0	-.0	-.0
656.9000	-79.63000	240.4000	-90.00000	.0	12.50000	1.000000
-.0	-.0	-.0	-.0	-.0	-.0	-.0

CONTROLS GROUP

.0	.0	25.40000	25.40000	581.4200	.0	3.740000
-.0	-.0	-.0	-.0	-.0	1.000000	1.000000
1.000000	1.000000	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	30.48000	15.24000	.5910000	.8530000
20.82800	-10.41400	1.201000	7.112000	-15.00000	30.00000	.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0

INTERFERENCE GROUP

-.2500000E-01	.1194400E-02	-.5278000E-04	.2010000E-06	-.1386000E-04	.8565000E-05	-.4570000E-01
.5207000E-02	.1042000E-04	-.0	-.0	-.0	-.0	-.0

FLIGHT CONSTANTS GROUP

20.00000	.0	.0	60.96000	.0	5.000000	.0
.0	50.00000	50.00000	50.00000	-.0	-.0	-.0
80.00000	.0	90.00000	.0	50.00000	-.0	-.0
-.0	-.0	-.0	-.0	-.0	340.1600	1.000000

ALLOWABLE ERROR GROUP

88.96000	88.96000	88.96000	54.23000	54.23000	-.0	-.0

ITERATION GROUP

20.00000	.0	.0	.2000000	1.000000	.3000000E-01	-.0
-.0	-.0	-.0	-.0	2.540000	.5080000	4067.500
2.000000	3.000000	4.000000	7.000000	8.000000	10.00000	-.0

STAB TIMES GROUP

-.0	-.0	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0

CONTROL SYSTEM GROUP

.9090000	.8000000E-01	.6670000	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0
-.0	-.0	-.0	-.0	-.0	-.0	-.0

INPUT DATA FOR MANEUVER

START (SEC)	DELT1 (SEC)	MAX1 (SEC)	DELT2 (SEC)	MAX2 (SEC)	MAX3 (SEC)
.000	.020	3.000	.020	-.000	-.000

J	XCIT(J,1)	(J,2)	(J,3)	(J,4)	(J,5)	(J,6)
20	.000	3.183	1.000	5.000	5.000	-.000

FIGURE B-4

***** START OF ITERATION 1 *****

VAR(I) 50.00000 50.00000 50.00000 .00000 80.00000 90.00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	-3348.1	-22.2	-22.2	-.9	-7.9	.0 .0	-207.7	3659.7	-1860.6	-2.1	-4652.2	-231.8
Y-FORCE	-.0				.0	.0 .0	-.0	.0	.0	-.0	.0	.0
Z-FORCE	4731.3	-308.7	-308.7	48.8	-6.2	.0 .0	-1550.5	-47111.7	-162.8		53175.2	955.9
ROLL	-.0	-603.8	603.8	.0	.0	.0 .0	-.0	.0	.0	-.0	.0	.0
PITCH	9380.8	-255.1	-255.1	275.2	80.3	.0 .0	7952.6	-1738.2	395.0	3.2	.0	2922.8
YAW	.0	43.5	-43.5	.0	-.0	.0 .0	.0	.0	.0	.0	.0	.0

PARTIAL DERIVATIVE MATRIX

	X-FORCE	Y-FORCE	Z-FORCE	YAW MOM	PITCH MOM	ROLL MOM
LONG STK	7903.0	.0	57826.	.0	-.31165E+06	.0
LAT STK	-.40901	-13367.	-49885.	19241.	-72100.	.17248E+06
PEDAL	-.62789	9420.2	.0	-60713.	.93915	5054.3
ROLL	.22611	52968.	-229.92	-378.58	-.91608	-65.707
L THROT 1	23151.	-.43210E-10	-.34102E+06	.43257E-09	62075.	-.42331E-09
L ANGLE 1	-.44232E+06	.32940E-23	-16744.	-.64258E-22	-32531.	.64258E-22
-ERROR	3348.1	.69945E-11	-4731.3	-.64769E-10	-9380.9	.63690E-10

CORRECTIONS .0347105 .0000000 .0000000 .0000000 .0200498 -.0058999

RATIO APPLIED TO CORRECTION VECTOR IS .5028247 FROM COMPONENT 1

FIGURE B-5

***** START OF ITERATION 4 *****

VAR(I) 63.45170 50.00000 50.00000 .00000 90.90328 86.97463

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.5	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0	6800.4	-1860.6	-2.1	-4652.2	-263.5
Y-FORCE	-.0				-.0	.0	.0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-3.3	-308.7	-308.7	9.4	-6.2	.0	.0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	-.0	-603.8	603.8	.0	.0	.0	.0	-.0	.0	.0	-.0	.0	.0
PITCH	-21.4	-255.1	-255.1	53.9	80.3	.0	.0	-1572.3	-1762.4	395.0	3.2	.0	3291.1
YAW	.0	43.5	-43.5	.0	-.0	.0	.0	.0	.0	-.0	.0	.0	.0

AIRCRAFT IS TRIMMED. 4 ITERATIONS .007 MINUTES ELAPSED COMPUTING TIME
PART 1

FIGURE B-6

.000 SECONDS MANEUVER TIME .007 MINUTES ELAPSED COMPUTING TIME NEWTONS•METRES•DEG•SEC UNITS

GROUND REFERENCE

	X	Y	Z			SPEED (KTS)	FLT PATH ANGLES	
VELOCITY	10.289	.000	.000	DISTANCE	.0	AIR 20.00	HEADING	.000
LOCATION	.000	.000	-60.960	ALTITUDE	61.0	GND 20.00	CLIMB	.000

FUSELAGE REFERENCE

	U	V	W	P	Q	R	
ACCEL	.000	.000	.000	.000	.000	.000	.000
VELOCITY	10.250	.000	.897	.000	.000	.000	.000

EULER ANGLES FROM GROUND

	PSI	THETA	PHI
VELOCITY	.000	.000	.000
LOCATION	.000	5.000	.000

CONTROL (PCT)			L. WING	R. WING	HSTAB	VSTAB	FUSELAGE		C.G. LOC (CM)		GUST (CG)		G-S	
THROTTLE	.00													
LONG STICK	63.45	ATK	6.750	6.750	-.523	-.000	ATKY	-.000	STA. LINE	556.77	FWD	.0	FWD	.09
LAT STICK	50.00	CL	.544	.544	-.034	-.000	ATKP	5.000	B. LINE	.00	LAT	.0	LAT	-.00
PEDAL	50.00	CD	.087	.087	.009	.010			W. LINE	251.03	VERT	.0	VERT	1.00
L THROT 1	90.90													
L THROT 2	.00		FIXED JET THRUST											
L ANGLE 1	86.97		RIGHT/CENTER		.0									
L ANGLE 2	.00		LEFT		.0									

FLAP DEFL. (DEG) 50.0

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.5	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0	6800.4	-1860.6	-2.1	-4652.2	-263.5
Y-FORCE	-.0				-.0	.0	.0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-3.3	-308.7	-308.7	9.4	-6.2	.0	.0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	-.0	-603.8	603.8	.0	.0	.0	.0	-.0	.0	.0	-.0	.0	.0
PITCH	-21.4	-255.1	-255.1	53.9	80.3	.0	.0	-1572.3	-1762.4	395.0	3.2	.0	3291.1
YAW	.0	43.5	-43.5	.0	-.0	.0	.0	.0	.0	-.0	.0	.0	.0

MOVABLE JET SUMMARY

NOZZLE	1	2	3	4	5	6
THRUST	13424.6	13424.6	13424.6	13424.6	.0	.0
THETA-J	82.6	82.6	82.6	82.6	.0	.0

REACTION JET SUMMARY

NOZZLE	1	2	3	4	5	6	7	8	9	10
THRUST	.0	237.4	-.0	.0	.0	.0	.0	.0	.0	.0

CONTROL SUMMARY

CONTROL DEFLECTIONS (CM)		SURFACE DEFLECTIONS (DEG)	
LONG STICK	4.10	STABILIZER	2.42
LAT STICK	-.00	AILERONS	-.00
		SPOILERS	.00
PEDALS	-.00	RUDDER	-.00

RCS DATA

	PCT	THETA (DEG)
FWD	.0	.00
AFT	.0	.00
LEFT/RT	.0	

FIGURE B-7

THE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON.METRES PER CM. OF CONTROL OR RAD. OF ANGLE

PARTIAL DERIVATIVE MATRIX

	X-FORCE	Y-FORCE	Z-FORCE	YAW MOM	PITCH MOM	ROLL MOM
THROTTLE	.13698E-09	.36215E-24	-.63711E-10	.0	-.49713E-09	.0
LONG STK	113.51	.36215E-24	-820.15	.0	-5474.0	.0
LAT STK	-.69981E-03	-103.58	-386.55	149.16	-558.68	1335.4
PEDAL	-.11430E-01	778.84	-.68261E-09	-5023.6	.17097E-01	414.78
YAW	3.3287	2375.1	.77898	4338.3	-7.0333	753.64
PITCH	-53617.	-.17767E-07	-10190.	.11488E-06	2048.6	-.91785E-08
ROLL	.68250E-01	52969.	-57.481	-378.79	-.24785	-65.735
L THROT 1	284.45	-.12499E-09	-2268.9	.80790E-09	2.5078	-.74873E-10
L THROT 2	.14016E-09	-.12237E-09	.75179E-09	.78991E-09	.14914E-08	-.70839E-10
L ANGLE 1	-3432.6	-.12237E-09	-415.87	.78991E-09	-233.93	-.70839E-10
L ANGLE 2	.14016E-09	-.12237E-09	.75179E-09	.78991E-09	.14914E-08	-.70839E-10

THE FOLLOWING MATRIX HAS UNITS OF METRES/SEC**2 OR RAD/SEC**2 PER CM. OF CONTROL OR RAD. OF ANGLE

PARTIAL DERIVATIVE MATRIX

	X-FORCE	Y-FORCE	Z-FORCE	YAW MOM	PITCH MOM	ROLL MOM
THROTTLE	.25162E-13	.66526E-28	-.11703E-13	.0	-.16369E-13	.0
LONG STK	.20852E-01	.66526E-28	-.15066	.0	-.18024	.0
LAT STK	-.12855E-06	-.19026E-01	-.71007E-01	.45274E-02	-.18396E-01	.26621
PEDAL	-.20996E-05	.14307	-.12539E-12	-.15248	.56296E-06	.82683E-01
YAW	.61148E-03	.43629	.14310E-03	.13168	-.23159E-03	.15023
PITCH	-9.8492	-.32637E-11	-1.8718	.34870E-11	.67455E-01	-.18297E-11
ROLL	.12537E-04	9.7302	-.10559E-01	-.11497E-01	-.81609E-05	-.13104E-01
L THROT 1	.52253E-01	-.22950E-13	-.41678	.24522E-13	.82575E-04	-.14925E-13
L THROT 2	.25747E-13	-.22479E-13	.13810E-12	.23976E-13	.49107E-13	-.14121E-13
L ANGLE 1	-.63055	-.22479E-13	-.76394E-01	.23976E-13	-.77026E-02	-.14121E-13
L ANGLE 2	.25747E-13	-.22479E-13	.13810E-12	.23976E-13	.49107E-13	-.14121E-13

FIGURE B-8

VAR(I) 10.44968 .89673 .00000 .00000 .00000 .00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	-45.1	-23.5	-23.5	-2.1	-8.2	.0 .0	33.0	6800.4	-1896.9	-2.2	-4652.2	-269.8
Y-FORCE	-.0				-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-7.7	-318.5	-318.5	10.6	-6.1	.0 .0	-235.1	-53253.9	-162.8		53175.2	1101.4
ROLL	-.0	-623.0	623.0	.0	.0	.0 .0	-.0	.0	.0	-.0	.0	.0
PITCH	83.9	-263.3	-263.3	60.4	80.7	.0 .0	-1572.3	-1762.4	393.3	3.3	.0	3407.6
YAW	.0	45.9	-45.9	.0	-.0	.0 .0	.0	.0	-.0	.0	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	-45.6	-1.3	-1.3	-.0	-.3	.0 .0	-.0	-.0	-36.3	-.1	.0	-6.3
Y-FORCE	-.0				.0	.0 .0	-.0	.0	.0	-.0	-.0	.0
Z-FORCE	-4.4	-9.8	-9.8	1.1	.1	.0 .0	.0	.0	.0		.0	14.0
ROLL	-.0	-19.2	19.2	.0	-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
PITCH	105.3	-8.3	-8.3	6.5	.4	.0 .0	.0	-.0	-1.7	.1	.0	116.5
YAW	.0	2.5	-2.5	.0	.0	.0 .0	.0	.0	.0	.0	.0	.0

VAR(I) 10.24968 1.09673 .00000 .00000 .00000 .00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	-11.5	-17.6	-17.6	-2.4	-7.9	.0 .0	33.0	6800.4	-1860.6	-2.1	-4652.2	-284.5
Y-FORCE	-.0				-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-111.1	-335.2	-335.2	.8	-10.8	.0 .0	-235.1	-53253.9	-199.1		53175.2	1082.2
ROLL	-.0	-655.6	655.6	.0	.0	.0 .0	-.0	.0	.0	-.0	.0	.0
PITCH	28.3	-275.1	-275.1	5.7	110.9	.0 .0	-1572.3	-1762.4	502.3	3.2	.0	3291.1
YAW	.0	34.3	-34.3	.0	-.0	.0 .0	.0	.0	-.0	.0	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	-12.0	4.7	4.7	-.3	-.0	.0 .0	-.0	-.0	.0	.0	.0	-21.0
Y-FORCE	-.0				.0	.0 .0	-.0	.0	.0	-.0	-.0	.0
Z-FORCE	-107.8	-26.5	-26.5	-8.6	-4.6	.0 .0	.0	.0	-36.3		.0	-5.3
ROLL	-.0	-51.8	51.8	.0	-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
PITCH	49.7	-20.0	-20.0	-48.3	30.6	.0 .0	.0	-.0	107.3	-.0	.0	-.0
YAW	.0	-9.1	9.1	.0	.0	.0 .0	.0	.0	.0	.0	.0	.0

FIGURE B-9

VAR(I) 10.24968 .89673 1.71887 .00000 .00000 .00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.9	-21.7	-21.7	-2.7	-7.9	.0 .0	33.0	6800.4	-1860.6	-2.1	-4652.2	-263.5
Y-FORCE	-.0				-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
Z-FORCE	-23.6	-311.0	-311.0	-6.2	-6.2	.0 .0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	-.0	-606.4	606.4	.0	.0	.0 .0	-.0	.0	.0	-.0	.0	.0
PITCH	-112.5	-256.8	-256.8	-33.7	80.3	.0 .0	-1572.3	-1762.4	395.0	3.1	.0	3291.1
YAW	.0	42.5	-42.5	.0	-.0	.0 .0	.0	.0	-.0	.0	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.4	.5	.5	-.6	.0	.0 .0	-.0	-.0	.0	.0	.0	.0
Y-FORCE	-.0				.0	.0 .0	-.0	.0	.0	-.0	-.0	.0
Z-FORCE	-20.3	-2.3	-2.3	-15.6	.0	.0 .0	.0	.0	.0		.0	-.0
ROLL	-.0	-4.6	4.6	.0	-.0	.0 .0	-.0	.0	-.0	-.0	.0	.0
PITCH	-91.1	-1.7	-1.7	-87.6	.0	.0 .0	.0	-.0	-.0	-.0	.0	-.0
YAW	.0	-1.0	1.0	.0	.0	.0 .0	.0	.0	.0	.0	.0	.0

VAR(I) 10.24968 .89673 .00000 .20000 .00000 .00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.6	-22.2	-22.2	-2.1	-7.9	.0 .0	33.0	6800.4	-1860.6	-2.0	-4652.2	-263.5
Y-FORCE	-47.3				-1.1	.0 .0	-.0	.0	-36.3	-9.9	.0	.0
Z-FORCE	-3.3	-308.7	-308.7	9.4	-6.2	.0 .0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	-14.7	-604.8	602.8	.0	.3	.0 .0	-.0	.0	1.7	-14.8	.0	.0
PITCH	-21.6	-255.1	-255.1	53.9	80.3	.0 .0	-1572.3	-1762.4	395.0	3.0	.0	3291.1
YAW	-83.1	44.7	-42.3	.0	-29.7	.0 .0	.0	.0	-107.3	51.5	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.1	.0	.0	.0	-.0	.0 .0	-.0	-.0	.0	.1	.0	.0
Y-FORCE	-47.3				-1.1	.0 .0	-.0	.0	-36.3	-9.9	-.0	.0
Z-FORCE	.0	.0	.0	.0	.0	.0 .0	.0	.0	.0		.0	-.0
ROLL	-14.7	-1.0	-1.0	.0	.3	.0 .0	-.0	.0	1.7	-14.8	.0	.0
PITCH	-.2	.0	.0	.0	-.0	.0 .0	.0	-.0	-.0	-.2	.0	-.0
YAW	-83.1	1.2	1.2	.0	-29.7	.0 .0	.0	.0	-107.3	51.5	.0	.0

FIGURE B-10

VAR(I) 10.24968 .89673 .00000 .00000 1.71887 .00000

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.5	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0	6800.4	-1860.6	-2.1	-4652.2	-263.5
Y-FORCE	-2.2				.0	.0	.0	-.0	.0	.0	-2.2	.0	.0
Z-FORCE	-3.3	-308.7	-308.7	9.4	-6.2	.0	.0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	-19.4	-611.9	595.7	.0	.0	.0	.0	-.0	.0	.0	-3.2	.0	.0
PITCH	-21.4	-255.1	-255.1	53.9	80.3	.0	.0	-1572.3	-1762.4	395.0	3.2	.0	3291.1
YAW	3.8	39.7	-47.2	.0	-.0	.0	.0	.0	.0	.0	11.4	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.0	.0	.0	.0	.0	.0	.0	-.0	-.0	.0	.0	.0	.0
Y-FORCE	-2.2				.0	.0	.0	-.0	.0	.0	-2.2	-.0	.0
Z-FORCE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		.0	-.0
ROLL	-19.4	-8.1	-8.1	.0	-.0	.0	.0	-.0	.0	-.0	-3.2	.0	.0
PITCH	-.0	.0	.0	.0	.0	.0	.0	.0	-.0	-.0	-.0	.0	-.0
YAW	3.8	-3.8	-3.8	.0	.0	.0	.0	.0	.0	.0	11.4	.0	.0

VAR(I) 10.24968 .89673 .00000 .00000 .00000 1.71887

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.6	-22.2	-22.2	-2.1	-7.9	.0	.0	33.0	6800.4	-1860.6	-2.0	-4652.2	-263.5
Y-FORCE	7.7				.0	.0	.0	-.0	.0	.0	7.7	.0	.0
Z-FORCE	-3.3	-308.7	-308.7	9.4	-6.2	.0	.0	-235.1	-53253.9	-162.8		53175.2	1087.5
ROLL	21.5	-598.8	608.8	.0	.0	.0	.0	-.0	.0	.0	11.5	.0	.0
PITCH	-21.5	-255.1	-255.1	53.9	80.3	.0	.0	-1572.3	-1762.4	395.0	3.0	.0	3291.1
YAW	-40.0	43.5	-43.4	.0	-.0	.0	.0	.0	.0	.0	-40.2	.0	.0

DELTA

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L		R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	.1	.0	.0	.0	.0	.0	.0	-.0	-.0	.0	.1	.0	.0
Y-FORCE	7.7				.0	.0	.0	-.0	.0	.0	7.7	-.0	.0
Z-FORCE	.0	.0	.0	.0	.0	.0	.0	.0	.0	.0		.0	-.0
ROLL	21.5	5.0	5.0	.0	-.0	.0	.0	-.0	.0	-.0	11.5	.0	.0
PITCH	-.1	.0	.0	.0	.0	.0	.0	.0	-.0	-.0	-.1	.0	-.0
YAW	-40.0	.1	.1	.0	.0	.0	.0	.0	.0	.0	-40.2	.0	.0

FIGURE B-11

STABILITY DERIVATIVE MATRICES

THE FOLLOWING MATRIX HAS UNITS OF NEWTONS OR NEWTON.METRES PER METRE/SEC OR RAD/SEC

	U	W	Q	V	P	R
X-FORCE	-227.7516	-59.92139	13.27643	.6368648	.2120590	2.605113
Z-FORCE	-21.75444	-539.0107	-675.8477	.1173234E-08	.7821557E-08	.7821557E-08
PITCH MOMENT	526.4452	248.3193	-3035.437	-.9545205	-.3471769	-3.896472
Y-FORCE	-.1944102E-09	-.1942660E-09	-.1294598E-08	-236.3292	-72.41961	256.3683
ROLL MOMENT	-.1129722E-09	-.1001263E-09	-.6667474E-09	-73.57192	-646.3906	718.2675
YAW MOMENT	.1255788E-08	.1253219E-08	.8352134E-08	-415.5515	127.2317	-1334.961

THE FOLLOWING MATRIX HAS UNITS OF 1/SEC, METRE/SEC OR 1/METRE.SEC

	U	W	Q	V	P	R
X-FORCE	-.4183497E-01	-.1100730E-01	.2436821E-02	.1169893E-03	.3895430E-04	.4785479E-03
Z-FORCE	-.3996196E-02	-.9901391E-01	-.1241503	.2155179E-12	.1436786E-11	.1436786E-11
PITCH MOMENT	.1733421E-01	.8176387E-02	-.9994754E-01	-.3142941E-04	-.1044365E-04	-.1282988E-03
Y-FORCE	-.3574905E-13	-.3568582E-13	-.2378120E-12	-.4341265E-01	-.1330317E-01	.4709373E-01
ROLL MOMENT	-.2252013E-13	-.1995939E-13	-.1329104E-12	-.1466599E-01	-.1288529	.1431810
YAW MOMENT	.3811609E-13	.3803811E-13	.2535067E-12	-.1261296E-01	.3861780E-02	-.4051919E-01

FIGURE B-12

LONGITUDINAL MODE

COEFFICIENTS OF CHARACTERISTIC EQUATIONS

U-S**2	U-S	U	ALPHA-S**2	ALPHA-S	ALPHA	THETA-S**2	THETA-S	THETA
.0	5443.8	237.21	.0	.0	86.326	.0	4.4396	5188.0
.0	.0	48.159	.0	5443.8	529.55	.0	-5378.2	.0
.0	.0	-546.08	.0	.0	-201.49	2951.8	295.02	.0

CONTROLS FIXED ROOTS

REAL	IMAG.	PERIOD	NAT.FREQ.	DAMPING	T*HALF-DBL
-.90876E-01	.0	.0	.90876E-01	1.0000	7.6274
.25581	.45856	13.702	.52508	-.48717	2.7097
-.66154	.0	.0	.66154	1.0000	1.0478

NUMERATOR ROOTS

DEPEND.VAR.	INDEP. VAR.	REAL1	IMAG1	REAL2	IMAG2	REAL3	IMAG3	GAIN
FWD VEL	LONG STICK	-.101234	.0	-.304566	-15.3271	-.304566	15.3271	.764154E-02
FWD VEL	THROTTLE	-.102244	.0	-.549137E-01	2.59113	-.549137E-01	-2.59113	.240465E-13
FWD VEL	L THROT 1	.423996	-.999557	.423996	.999557	-1.46835	.0	.157291E-01
FWD VEL	L THROT 2	-.113112	.0	-3.62110	.0	3.60487	.0	.376856E-13
FWD VEL	L ANGLE 1	-.731885E-01	.0	-.499371	.0	.375966	.0	-.634804
FWD VEL	L ANGLE 2	-.113112	.0	-3.62110	.0	3.60487	.0	.376856E-13
ANG OF ATK	LONG STICK	-.204716E-01	-.150121	-.204716E-01	.150121	-12.1643	.0	-.147638E-01
ANG OF ATK	THROTTLE	-.778709E-02	-.151252	-.778709E-02	.151252	-12.1553	.0	-.134630E-14
ANG OF ATK	L THROT 1	.235951	-.481210	.235951	.481210	-.613756	.0	-.407963E-01
ANG OF ATK	L THROT 2	-.212619E-01	-.233272	-.212619E-01	.233272	-3.78703	.0	.131531E-13
ANG OF ATK	L ANGLE 1	-.378573E-01	.0	-1.77129	1.53439	-1.77129	-1.53439	-.205534E-02
ANG OF ATK	L ANGLE 2	-.212619E-01	-.233272	-.212619E-01	.233272	-3.78703	.0	.131531E-13
PITCH ANG	LONG STICK	-.108555	.0	-.371253E-01	.0	.0	.0	-.180240
PITCH ANG	THROTTLE	-.104574	.0	-.154771E-01	.0	.0	.0	-.163688E-13
PITCH ANG	L THROT 1	.101492E-01	.0	30.1487	.0	.0	.0	.825744E-04
PITCH ANG	L THROT 2	-.131963	.0	-.409710E-01	.0	.0	.0	.491065E-13
PITCH ANG	L ANGLE 1	-.926331E-01	.0	-1.54831	.0	.0	.0	-.770261E-02
PITCH ANG	L ANGLE 2	-.131963	.0	-.409710E-01	.0	.0	.0	.491065E-13

ALL TIMES ARE IN UNITS OF SECONDS
ALL GAINS ARE IN UNITS OF M/SEC, RAD OR RAD/SEC PER CM. OF CONTROLLER DEFLECTION

FIGURE B-13

LATERAL MODE

COEFFICIENTS OF CHARACTERISTIC EQUATIONS

BETA-S**2	BETA-S	BETA	PHI-S**2	PHI-S	PHI	R-S**2	R-S	R
.0	5443.8	236.33	.0	4.8402	-5188.0	.0	.0	5418.4
.0	.0	109.51	508.19	56.198	.0	.0	-10.310	-63.376
.0	.0	407.56	-10.310	-5.9312	.0	.0	3131.5	136.38

CONTROLS FIXED ROOTS

REAL	IMAG.	PERIOD	NAT.FREQ.	DAMPING	T*HALF-DBL
-.11545	.0	.0	.11545	1.0000	6.0041
.30682	.45333	13.860	.54740	-.56050	2.2591
-.69462	.0	.0	.69462	1.0000	.99788

NUMERATOR ROOTS

DEPEND.VAR.	INDEP. VAR.	REAL1	IMAG1	REAL2	IMAG2	REAL3	IMAG3	GAIN
SD SLP ANG	LAT STICK	-.434285E-01	.0	10.9062	.0	-12.1170	.0	-.184922E-02
SD SLP ANG	PEDAL	-.384376	.0	.311606	.0	-11.1046	.0	.139053E-01
ROLL ANGLE	LAT STICK	-.399911	.0	.311590	.0	.0	.0	.256955
ROLL ANGLE	PEDAL	-1.45356	-1.47580	-1.45356	1.47580	.0	.0	-.783576E-02
YAW RATE	LAT STICK	-1.45803	-2.22932	-1.45803	2.22932	2.41793	.0	.181648E-02
YAW RATE	PEDAL	.238880	-.506234	.238880	.506234	-.643433	.0	-.154011

ALL TIMES ARE IN UNITS OF SECONDS
ALL GAINS ARE IN UNITS OF M/SEC, RAD OR RAD/SEC PER CM. OF CONTROLLER DEFLECTION

.005 MINUTES USED IN STAB .013 MINUTES TOTAL RUN TIME

FIGURE B-14

3.000 SECONDS MANEUVER TIME .065 MINUTES ELAPSED COMPUTING TIME NEWTONS•METRES•DEG•SEC UNITS

GROUND REFERENCE

	X	Y	Z			SPEED (KTS)	FLT PATH ANGLES	
VELOCITY	10.323	-.000	-.034	DISTANCE	30.9	AIR 20.07	HEADING	-.000
LOCATION	30.895	-.000	-61.014	ALTITUDE	61.0	GND 20.07	CLIMB	.186

FUSELAGE REFERENCE

	U	V	W	P	Q	R		EULER ANGLES FROM GROUND	PSI	THETA	PHI
ACCEL	.016	-.000	.116	.000	-.021	.000	.000				
VELOCITY	10.290	-.000	.834	-.000	-.105	.000	.000	VELOCITY	.000	-.105	-.000
								LOCATION	.000	4.818	-.000

CONTROL (PCT)			L. WING	R. WING	HSTAB	VSTAB	FUSELAGE		C.G. LOC (CM)		GUST (CG)		G-S	
THROTTLE	.00													
LONG STICK	63.45	ATK	6.375	6.375	-.734	.000	ATKY	.000	STA. LINE	556.77	FWD	.0	FWD	.09
LAT STICK	50.00	CL	.529	.529	-.047	.000	ATKP	4.632	B. LINE	.00	LAT	.0	LAT	.00
PEDAL	50.00	CD	.085	.085	.009	.010			W. LINE	251.03	VERT	.0	VERT	.98
L THROT 1	89.71													
L THROT 2	.00		FIXED JET THRUST											
L ANGLE 1	86.97		RIGHT/CENTER		.0									
L ANGLE 2	.00		LEFT		.0		FLAP DEFL. (DEG)		50.0					

FORCE AND MOMENT SUMMARY

	TOTAL	R.WING	L.WING	HSTAB	FUS	R*FIXED JETS*L	R/JETS	L/JETS	INLET	VSTAB	W/GYRO	P.I.E.
X-FORCE	77.7	-23.8	-23.8	-1.9	-8.0	.0 .0	32.6	6711.2	-1867.9	-2.1	-4483.8	-254.8
Y-FORCE	-.0				.0	.0 .0	-.0	.0	.0	.0	-.0	.0
Z-FORCE	732.8	-302.1	-302.1	13.3	-5.0	.0 .0	-232.2	-52555.0	-151.3		53189.7	1077.5
ROLL	.0	-590.9	590.9	.0	-.0	.0 .0	-.0	.0	-.0	.0	.0	.0
PITCH	-10.9	-250.3	-250.3	76.0	70.9	.0 .0	-1553.0	-1739.3	360.9	3.2	.0	3270.9
YAW	.0	46.6	-46.6	.0	.0	.0 .0	.0	.0	.0	-.0	.0	.0

MOVABLE JET SUMMARY

NOZZLE	1	2	3	4	5	6
THRUST	13248.4	13248.4	13248.4	13248.4	.0	.0
THETA-J	82.6	82.6	82.6	82.6	.0	.0

REACTION JET SUMMARY

NOZZLE	1	2	3	4	5	6	7	8	9	10
THRUST	.0	234.5	-.0	.0	.0	.0	.0	.0	.0	.0

CONTROL SUMMARY

CONTROL DEFLECTIONS (CM)		SURFACE DEFLECTIONS (DEG)		RCS DATA	PCT	THETA (DEG)
LONG STICK	4.10	STABILIZER	2.42			
LAT STICK	-.00	AILERONS	-.00	FWD	.0	.00
		SPOILERS	.00	AFT	.0	.00
PEDALS	-.00	RUDDER	-.00	LEFT/RT	.0	

FIGURE B-15

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
NAVAL AIR DEVELOPMENT CENTER
COMPILED JULY 1976
COMPUTED 09/13/76.

3 1000

CHECK RUN FOR CDC PROGRAM VERSION
XV-6A KESTREL DATA
TRIM + STABILITY

SYMBOL 1 =LIFT THROT 1, PCT
SYMBOL 2 =THETA, DEG
SYMBOL 4 =ALPHA (FUS), DEG
3 FOR 1 + 2 ON SAME PRINT POS.
5 FOR 1 + 4 ON SAME PRINT POS.
6 FOR 2 + 4 ON SAME PRINT POS.
7 FOR 1 + 2 + 4 ON SAME PRINT POS.

SCALE	1	FROM	50.000	TO	100.000	1 INCH =	5.000
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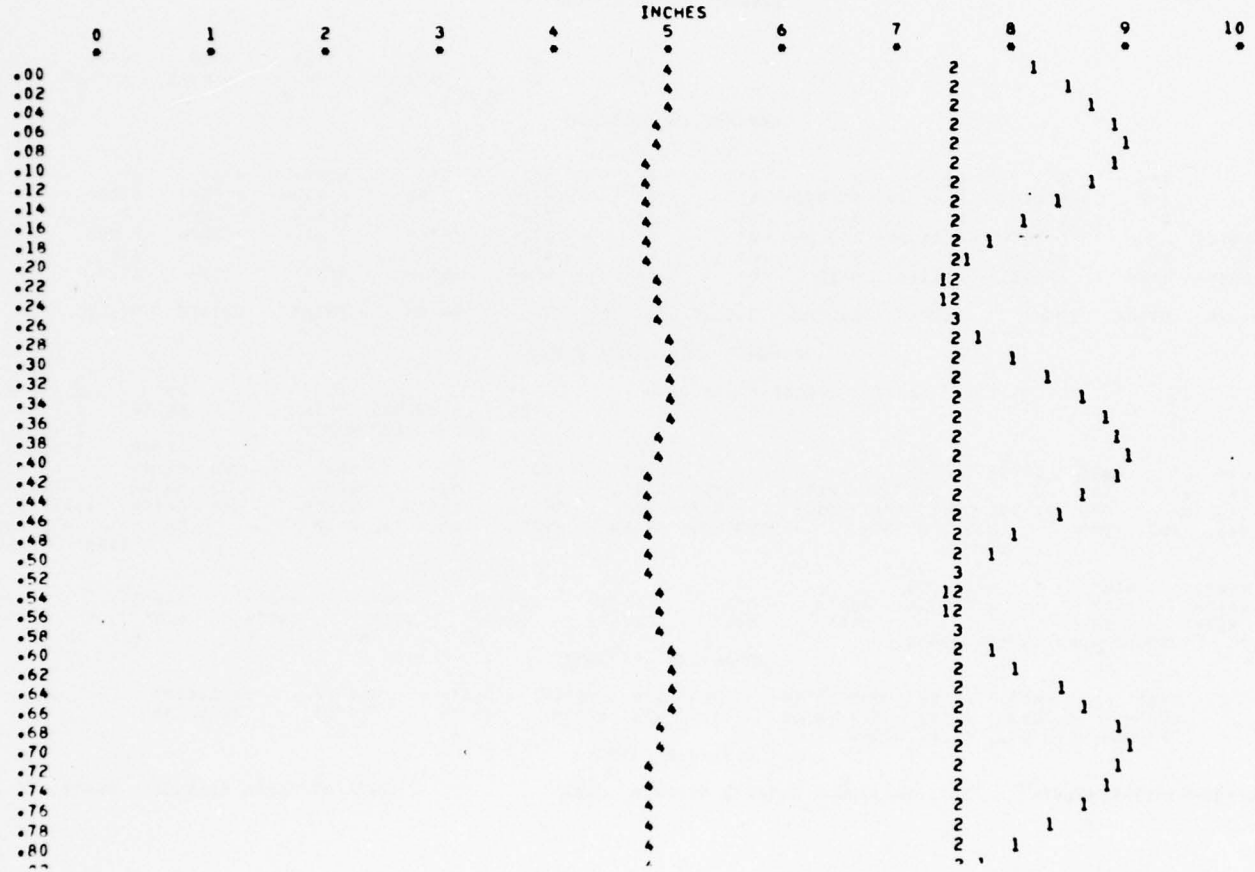

FIGURE B-16

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
NAVAL AIR DEVELOPMENT CENTER
COMPILED JULY 1976
COMPUTED 09/13/76.

11 1000 CHECK RUN FOR CDC PROGRAM VERSION
XV-6A KESTREL DATA
TRIM + STABILITY

LEAST SQUARES CURVE FIT STARTING AFTER 1.000 SECONDS MANEUVER TIME

F(T) = AMPLITUDE*SIN(OMEGA*T + PHASE ANGLE) + CONSTANT WITH OMEGA = 3.183 CPS

VARIABLE	AMPLITUDE	PHASE ANGLE (DEGREES)	CONSTANT	COEF OF CORR
LIFT THROT 1, PCT	3.9370	-.11331E-03	90.903	1.00000
THETA, DEG	.17756E-02	-167.86	4.9084	.26550E-01
ALPHA (FUS), DEG	.11483	90.978	4.8144	.90380

FIGURE B-17

V/STOL AIRCRAFT DYNAMIC ANALYSIS PROGRAM
NAVAL AIR DEVELOPMENT CENTER
COMPILED JULY 1976
COMPUTED 09/13/76.

11 1000 CHECK RUN FOR CDC PROGRAM VERSION
XV-6A KESTREL DATA
TRIM + STABILITY

AMPLITUDE AND PHASE ANGLE COMPARISONS

VARIABLES		AMPLITUDE RATIO	PHASE ANGLE DIFFERENCE
THETA, DEG	/LIFT THROT 1, PCT	.45101E-03	-167.86
ALPHA (FUS), DEG	/LIFT THROT 1, PCT	.29168E-01	90.978

.004 MINUTES USED IN CURVE FITTING .079 MINUTES TOTAL COMPUTING TIME

FIGURE B-18

D I S T R I B U T I O N L I S T (Cont'd)

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